

74HC157; 74HCT157

Quad 2-input multiplexer

Rev. 8 — 28 December 2015

Product data sheet

1. General description

The 74HC157; 74HCT157 is a high-speed Si-gate CMOS device and is pin compatible with Low-power Schottky TTL. It is specified in compliance with JEDEC standard no. 7A.

The 74HC/HCT157 are quad 2-input multiplexers which select 4 bits of data from two sources under the control of a common data select input (S). The enable input (\bar{E}) is active LOW. When \bar{E} is HIGH, all of the outputs (1Y to 4Y) are forced LOW regardless of all other input conditions.

Moving the data from two groups of registers to four common output buses is a common use of the 74HC/HCT157. The state of the common data select input (S) determines the particular register from which the data comes. It can also be used as function generator. The device is useful for implementing highly irregular logic by generating any four of the 16 different functions of two variables with one variable common. The 74HC/HCT157 is logic implementation of a 4-pole, 2-position switch, where the position of the switch is determined by the logic levels applied to S.

The logic equations are:

$$1Y = \bar{E} \times (1I1 \times S + 1I0 \times \bar{S})$$

$$2Y = \bar{E} \times (2I1 \times S + 2I0 \times \bar{S})$$

$$3Y = \bar{E} \times (3I1 \times S + 3I0 \times \bar{S})$$

$$4Y = \bar{E} \times (4I1 \times S + 4I0 \times \bar{S})$$

The 74HC/HCT157 is identical to the 74HC158 but has non-inverting (true) outputs.

2. Features and benefits

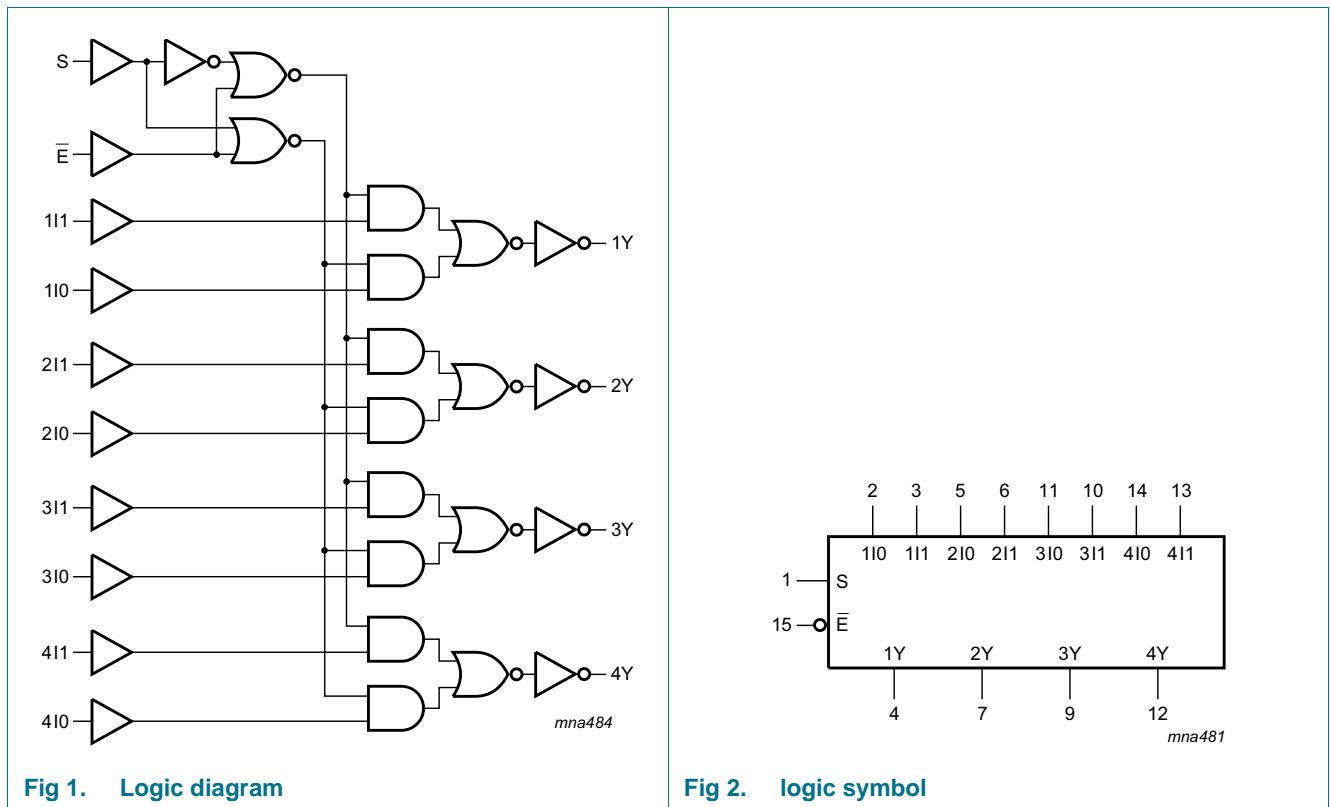
- Low-power dissipation
- Complies with JEDEC standard no. 7A
- Input levels:
 - ◆ For 74HC157: CMOS level
 - ◆ For 74HCT157: TTL level
- Non-inverting data path
- ESD protection:
 - ◆ HBM JESD22-A114F exceeds 2 000 V
 - ◆ MM JESD22-A115-A exceeds 200 V
- Specified from $-40\text{ }^{\circ}\text{C}$ to $+85\text{ }^{\circ}\text{C}$ and from $-40\text{ }^{\circ}\text{C}$ to $+125\text{ }^{\circ}\text{C}$

3. Ordering information

Table 1. Ordering information

| Type number | Package | | | Version |
|-------------|-------------------|----------|--|----------|
| | Temperature range | Name | Description | |
| 74HC157D | -40 °C to +125 °C | SO16 | plastic small outline package; 16 leads; body width 3.9 mm | SOT109-1 |
| 74HCT157D | | | | |
| 74HC157DB | -40 °C to +125 °C | SSOP16 | plastic shrink small outline package; 16 leads; body width 5.3 mm | SOT338-1 |
| 74HCT157DB | | | | |
| 74HC157PW | -40 °C to +125 °C | TSSOP16 | plastic thin shrink small outline package; 16 leads; body width 4.4 mm | SOT403-1 |
| 74HCT157PW | | | | |
| 74HC157BQ | -40 °C to +125 °C | DHVQFN16 | plastic dual in-line compatible thermal enhanced very thin quad flat package; no leads; 16 terminals; body 2.5 × 3.5 × 0.85 mm | SOT763-1 |
| 74HCT157BQ | | | | |

4. Functional diagram



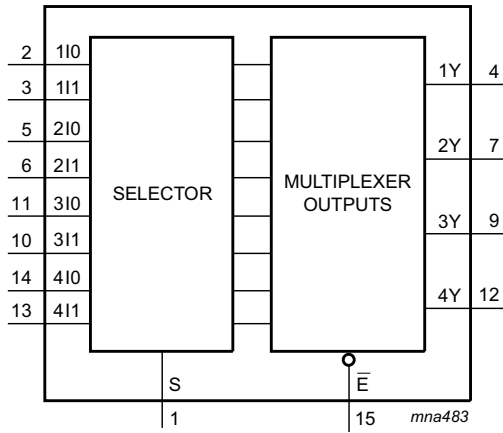


Fig 3. Logic symbol

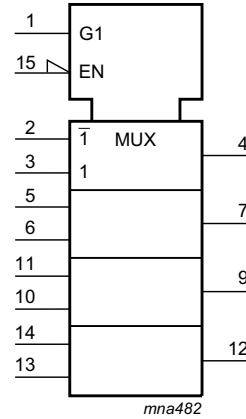


Fig 4. IEC logic symbol

5. Pinning information

5.1 Pinning

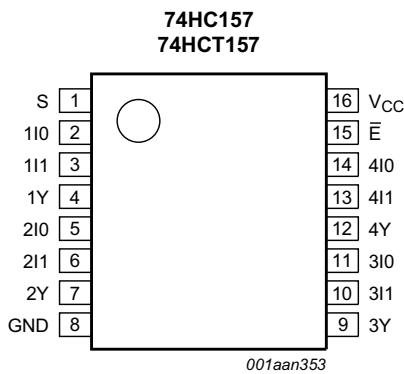
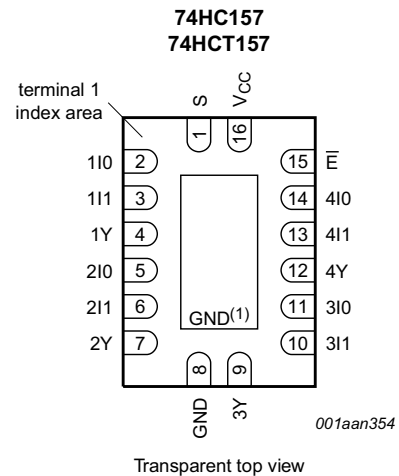


Fig 5. Pin configuration SO16, (T)SSOP16



- (1) This is not a supply pin. The substrate is attached to this pad using conductive die attach material. There is no electrical or mechanical requirement to solder this pad. However, if it is soldered, the solder land should remain floating or be connected to GND.

Fig 6. Pin configuration DHVQFN16

5.2 Pin description

Table 2. Pin description

| Symbol | Pin | Description |
|-----------------|--------------|---------------------------|
| S | 1 | common data select input |
| 1I0 to 4I0 | 2, 5, 11, 14 | data inputs from source 0 |
| 1I1 to 4I1 | 3, 6, 10, 13 | data inputs from source 1 |
| 1Y to 4Y | 4, 7, 9, 12 | multiplexer outputs |
| GND | 8 | ground (0 V) |
| \overline{E} | 15 | enable input (active LOW) |
| V _{CC} | 16 | supply voltage |

6. Functional description

Table 3. Function table^[1]

| Input | | | | Output |
|----------------|---|-----|-----|--------|
| \overline{E} | S | nI0 | nI1 | nY |
| H | X | X | X | L |
| L | L | L | X | L |
| L | L | H | X | H |
| L | H | X | L | L |
| L | H | X | 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 | V | |
| I _{IK} | input clamping current | V _I < -0.5 V or V _I > V _{CC} + 0.5 V | - | ±20 | mA | |
| I _{OK} | output clamping current | V _O < -0.5 V or V _O > V _{CC} + 0.5 V | - | ±20 | 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 | | | | |
| | | SO16 package | [1] | - | 500 | mW |
| | | (T)SSOP16 package | [2] | - | 500 | mW |
| | | DHVQFN16 package | [3] | - | 500 | mW |

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

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

[3] 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 | 74HC157 | | | 74HCT157 | | | Unit |
|------------------|-------------------------------------|-------------------------|---------|------|-----------------|----------|------|-----------------|------|
| | | | Min | Typ | Max | Min | Typ | Max | |
| V _{CC} | supply voltage | | 2.0 | 5.0 | 6.0 | 4.5 | 5.0 | 5.5 | V |
| V _I | input voltage | | 0 | - | V _{CC} | 0 | - | V _{CC} | V |
| V _O | output voltage | | 0 | - | V _{CC} | 0 | - | V _{CC} | V |
| T _{amb} | ambient temperature | | -40 | +25 | +125 | -40 | +25 | +125 | °C |
| Δt/ΔV | input transition rise and fall rate | V _{CC} = 2.0 V | - | - | 625 | - | - | - | ns/V |
| | | V _{CC} = 4.5 V | - | 1.67 | 139 | - | 1.67 | 139 | ns/V |
| | | V _{CC} = 6.0 V | - | - | 83 | - | - | - | ns/V |

9. Static characteristics

Table 6. Static characteristics

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

| Symbol | Parameter | Conditions | T _{amb} = 25 °C | | | T _{amb} = -40 °C to +85 °C | | T _{amb} = -40 °C to +125 °C | | Unit |
|-----------------|---------------------------|--|--------------------------|------|------|-------------------------------------|------|--------------------------------------|------|------|
| | | | Min | Typ | Max | Min | Max | Min | Max | |
| 74HC157 | | | | | | | | | | |
| V _{IH} | HIGH-level input voltage | V _{CC} = 2.0 V | 1.5 | 1.2 | - | 1.5 | - | 1.5 | - | V |
| | | V _{CC} = 4.5 V | 3.15 | 2.4 | - | 3.15 | - | 3.15 | - | V |
| | | V _{CC} = 6.0 V | 4.2 | 3.2 | - | 4.2 | - | 4.2 | - | V |
| V _{IL} | LOW-level input voltage | V _{CC} = 2.0 V | - | 0.8 | 0.5 | - | 0.5 | - | 0.5 | V |
| | | V _{CC} = 4.5 V | - | 2.1 | 1.35 | - | 1.35 | - | 1.35 | V |
| | | V _{CC} = 6.0 V | - | 2.8 | 1.8 | - | 1.8 | - | 1.8 | V |
| V _{OH} | HIGH-level output voltage | V _I = V _{IH} or V _{IL} | | | | | | | | |
| | | I _O = -20 μA; V _{CC} = 2.0 V | 1.9 | 2.0 | - | 1.9 | - | 1.9 | - | V |
| | | I _O = -20 μA; V _{CC} = 4.5 V | 4.4 | 4.5 | - | 4.4 | - | 4.4 | - | V |
| | | I _O = -20 μA; V _{CC} = 6.0 V | 5.9 | 6.0 | - | 5.9 | - | 5.9 | - | V |
| | | I _O = -4.0 mA; V _{CC} = 4.5 V | 3.98 | 4.32 | - | 3.84 | - | 3.7 | - | V |
| V _{OL} | LOW-level output voltage | V _I = V _{IH} or V _{IL} | | | | | | | | |
| | | I _O = 20 μA; V _{CC} = 2.0 V | - | 0 | 0.1 | - | 0.1 | - | 0.1 | V |
| | | I _O = 20 μA; V _{CC} = 4.5 V | - | 0 | 0.1 | - | 0.1 | - | 0.1 | V |
| | | I _O = 20 μA; V _{CC} = 6.0 V | - | 0 | 0.1 | - | 0.1 | - | 0.1 | V |
| | | I _O = 4.0 mA; V _{CC} = 4.5 V | - | 0.15 | 0.26 | - | 0.33 | - | 0.4 | V |
| I _I | input leakage current | V _I = V _{CC} or GND; V _{CC} = 6.0 V | - | - | ±0.1 | - | ±1.0 | - | ±1.0 | μA |
| | | V _I = V _{CC} or GND; I _O = 0 A; V _{CC} = 6.0 V | - | - | 8.0 | - | 80 | - | 160 | μA |

Table 6. Static characteristics ...continued

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

| Symbol | Parameter | Conditions | T _{amb} = 25 °C | | | T _{amb} = -40 °C to +85 °C | | T _{amb} = -40 °C to +125 °C | | Unit |
|------------------|---------------------------|--|--------------------------|------|------|-------------------------------------|------|--------------------------------------|------|------|
| | | | Min | Typ | Max | Min | Max | Min | Max | |
| C _I | input capacitance | | - | 3.5 | - | - | - | - | - | pF |
| 74HCT157 | | | | | | | | | | |
| V _{IH} | HIGH-level input voltage | V _{CC} = 4.5 V to 5.5 V | 2.0 | 1.6 | - | 2.0 | - | 2.0 | - | V |
| V _{IL} | LOW-level input voltage | V _{CC} = 4.5 V to 5.5 V | - | 1.2 | 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 = -20 μA | 4.4 | 4.5 | - | 4.4 | - | 4.4 | - | V |
| | | I _O = -4 mA | 3.98 | 4.32 | - | 3.84 | - | 3.7 | - | V |
| V _{OL} | LOW-level output voltage | V _I = V _{IH} or V _{IL} ; V _{CC} = 4.5 V | | | | | | | | |
| | | I _O = 20 μA | - | 0 | 0.1 | - | 0.1 | - | 0.1 | V |
| | | I _O = 4.0 mA | - | 0.15 | 0.26 | - | 0.33 | - | 0.4 | V |
| I _I | input leakage current | V _I = V _{CC} or GND; V _{CC} = 5.5 V | - | - | ±0.1 | - | ±1.0 | - | ±1.0 | μA |
| I _{CC} | supply current | V _I = V _{CC} or GND; I _O = 0 A; V _{CC} = 5.5 V | - | - | 8.0 | - | 80 | - | 160 | μA |
| ΔI _{CC} | additional supply current | V _I = V _{CC} - 2.1 V; other inputs at V _{CC} or GND; V _{CC} = 4.5 V to 5.5 V; I _O = 0 A | | | | | | | | |
| | | per input pin; nI0, nI1 inputs | - | 100 | 360 | - | 450 | - | 490 | μA |
| | | per input pin; \bar{E} input | - | 60 | 216 | - | 270 | - | 294 | μA |
| | | per input pin; S input | - | 100 | 360 | - | 450 | - | 490 | μA |
| C _I | input capacitance | | - | 3.5 | - | - | - | - | - | pF |

10. Dynamic characteristics

Table 7. Dynamic characteristics

Voltages are referenced to GND (ground = 0 V); $C_L = 50$ pF unless otherwise specified; for test circuit see [Figure 9](#).

| Symbol | Parameter | Conditions | $T_{amb} = 25\text{ °C}$ | | | $T_{amb} = -40\text{ °C}$ to $+85\text{ °C}$ | | $T_{amb} = -40\text{ °C}$ to $+125\text{ °C}$ | | Unit |
|-------------------------------|-------------------------------|--|--------------------------|-----|-----|---|-----|--|-----|------|
| | | | Min | Typ | Max | Min | Max | Min | Max | |
| 74HC157 | | | | | | | | | | |
| t_{pd} | propagation delay | nI0, nI1 to nY; see Figure 7 ^[1] | | | | | | | | |
| | | $V_{CC} = 2.0$ V | - | 36 | 125 | - | 155 | - | 190 | ns |
| | | $V_{CC} = 4.5$ V | - | 13 | 25 | - | 31 | - | 38 | ns |
| | | $V_{CC} = 5$ V; $C_L = 15$ pF | - | 11 | - | - | - | - | - | ns |
| | | $V_{CC} = 6.0$ V | - | 10 | 21 | - | 26 | - | 32 | ns |
| | | S to nY; see Figure 7 ^[1] | | | | | | | | |
| | | $V_{CC} = 2.0$ V | - | 41 | 125 | - | 155 | - | 190 | ns |
| | | $V_{CC} = 4.5$ V | - | 15 | 25 | - | 31 | - | 38 | ns |
| | | $V_{CC} = 5$ V; $C_L = 15$ pF | - | 12 | - | - | - | - | - | ns |
| | | $V_{CC} = 6.0$ V | - | 12 | 21 | - | 26 | - | 32 | ns |
| | | \bar{E} to nY; see Figure 8 ^[1] | | | | | | | | |
| | | $V_{CC} = 2.0$ V | - | 39 | 115 | - | 145 | - | 175 | ns |
| | | $V_{CC} = 4.5$ V | - | 14 | 23 | - | 29 | - | 35 | ns |
| | | $V_{CC} = 5$ V; $C_L = 15$ pF | - | 11 | - | - | - | - | - | ns |
| $V_{CC} = 6.0$ V | - | 11 | 20 | - | 25 | - | 30 | ns | | |
| t_t | transition time | nY; see Figure 7 ^[2] | | | | | | | | |
| | | $V_{CC} = 2.0$ V | - | 19 | 75 | - | 95 | - | 110 | ns |
| | | $V_{CC} = 4.5$ V | - | 7 | 15 | - | 19 | - | 22 | ns |
| | | $V_{CC} = 6.0$ V | - | 6 | 13 | - | 16 | - | 19 | ns |
| C_{PD} | power dissipation capacitance | $C_L = 50$ pF; $f = 1$ MHz; $V_I = \text{GND to } V_{CC}$ ^[3] | - | 70 | - | - | - | - | - | pF |
| 74HCT157 | | | | | | | | | | |
| t_{pd} | propagation delay | nI0, nI1 to nY; see Figure 7 ^[1] | | | | | | | | |
| | | $V_{CC} = 4.5$ V | - | 16 | 27 | - | 34 | - | 41 | ns |
| | | $V_{CC} = 5$ V; $C_L = 15$ pF | - | 13 | - | - | - | - | - | ns |
| | | S to nY; see Figure 7 ^[1] | | | | | | | | |
| | | $V_{CC} = 4.5$ V | - | 22 | 37 | - | 46 | - | 56 | ns |
| | | $V_{CC} = 5$ V; $C_L = 15$ pF | - | 19 | - | - | - | - | - | ns |
| | | \bar{E} to nY; see Figure 8 ^[1] | | | | | | | | |
| | | $V_{CC} = 4.5$ V | - | 15 | 26 | - | 33 | - | 39 | ns |
| $V_{CC} = 5$ V; $C_L = 15$ pF | - | 12 | - | - | - | - | - | ns | | |

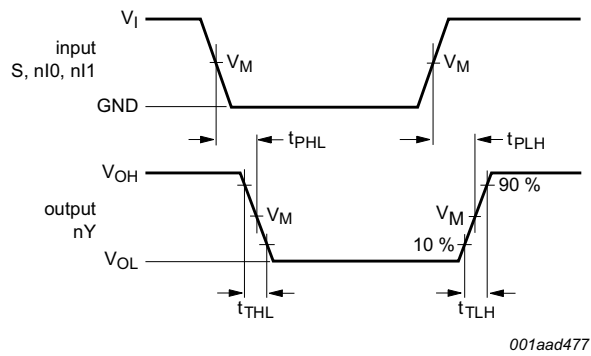
Table 7. Dynamic characteristics ...continued

Voltages are referenced to GND (ground = 0 V); $C_L = 50 \text{ pF}$ unless otherwise specified; for test circuit see [Figure 9](#).

| Symbol | Parameter | Conditions | $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$ | | | $T_{\text{amb}} = -40 \text{ }^\circ\text{C}$ to $+85 \text{ }^\circ\text{C}$ | | $T_{\text{amb}} = -40 \text{ }^\circ\text{C}$ to $+125 \text{ }^\circ\text{C}$ | | Unit |
|----------|-------------------------------|--|--|-----|-----|--|-----|---|-----|------|
| | | | Min | Typ | Max | Min | Max | Min | Max | |
| t_t | transition time | nY ; see Figure 7 [2] | | | | | | | | |
| | | $V_{CC} = 4.5 \text{ V}$ | - | 7 | 15 | - | 19 | - | 22 | ns |
| C_{PD} | power dissipation capacitance | $C_L = 50 \text{ pF}$; $f = 1 \text{ MHz}$; $V_I = \text{GND to } V_{CC} - 1.5 \text{ V}$ [3] | - | 70 | - | - | - | - | - | pF |

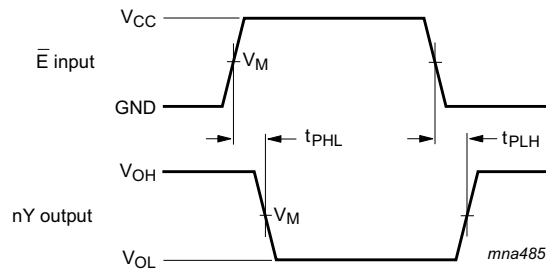
- [1] t_{pd} is the same as t_{PLH} and t_{PHL} .
- [2] t_t is the same as t_{THL} and t_{TLH} .
- [3] C_{PD} is used to determine the dynamic power dissipation (P_D in μW).
 $P_D = C_{PD} \times V_{CC}^2 \times f_i \times N + \sum(C_L \times V_{CC}^2 \times f_o)$ where:
 f_i = input frequency in MHz;
 f_o = output frequency in MHz;
 C_L = output load capacitance in pF;
 V_{CC} = supply voltage in V;
 N = number of inputs switching;
 $\sum(C_L \times V_{CC}^2 \times f_o)$ = sum of 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 7. Propagation delay input (nI0, nI1, S) to output (nYn)

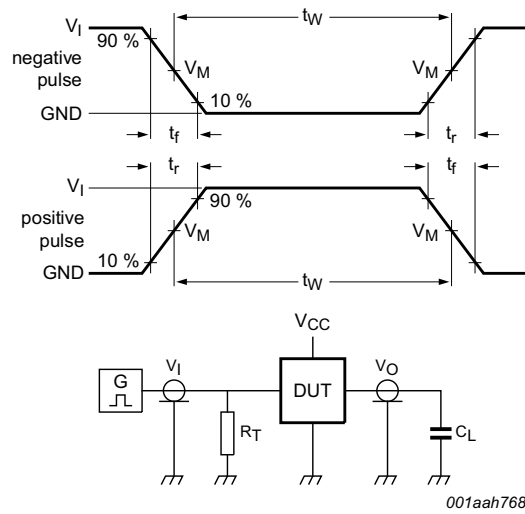


Measurement points are given in [Table 8](#).
 V_{OL} and V_{OH} are typical voltage output levels that occur with the output load.

Fig 8. Propagation delay input (\bar{E}) to output (nY)

Table 8. Measurement points

| Type | Input | Output |
|----------|-------------|-------------|
| | V_M | V_M |
| 74HC157 | $0.5V_{CC}$ | $0.5V_{CC}$ |
| 74HCT157 | 1.3 V | 1.3 V |



001aah768

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.

C_L = Load capacitance including jig and probe capacitance.

R_L = Load resistance.

S1 = Test selection switch.

Fig 9. Test circuit for measuring switching times

Table 9. Test data

| Type | Input | | Load | Test |
|----------|----------|------------|--------------|--------------------|
| | V_I | t_r, t_f | C_L | |
| 74HC157 | V_{CC} | 6.0 ns | 15 pF, 50 pF | t_{PLH}, t_{PHL} |
| 74HCT157 | 3.0 V | 6.0 ns | 15 pF, 50 pF | t_{PLH}, t_{PHL} |

12. Package outline

SO16: plastic small outline package; 16 leads; body width 3.9 mm

SOT109-1

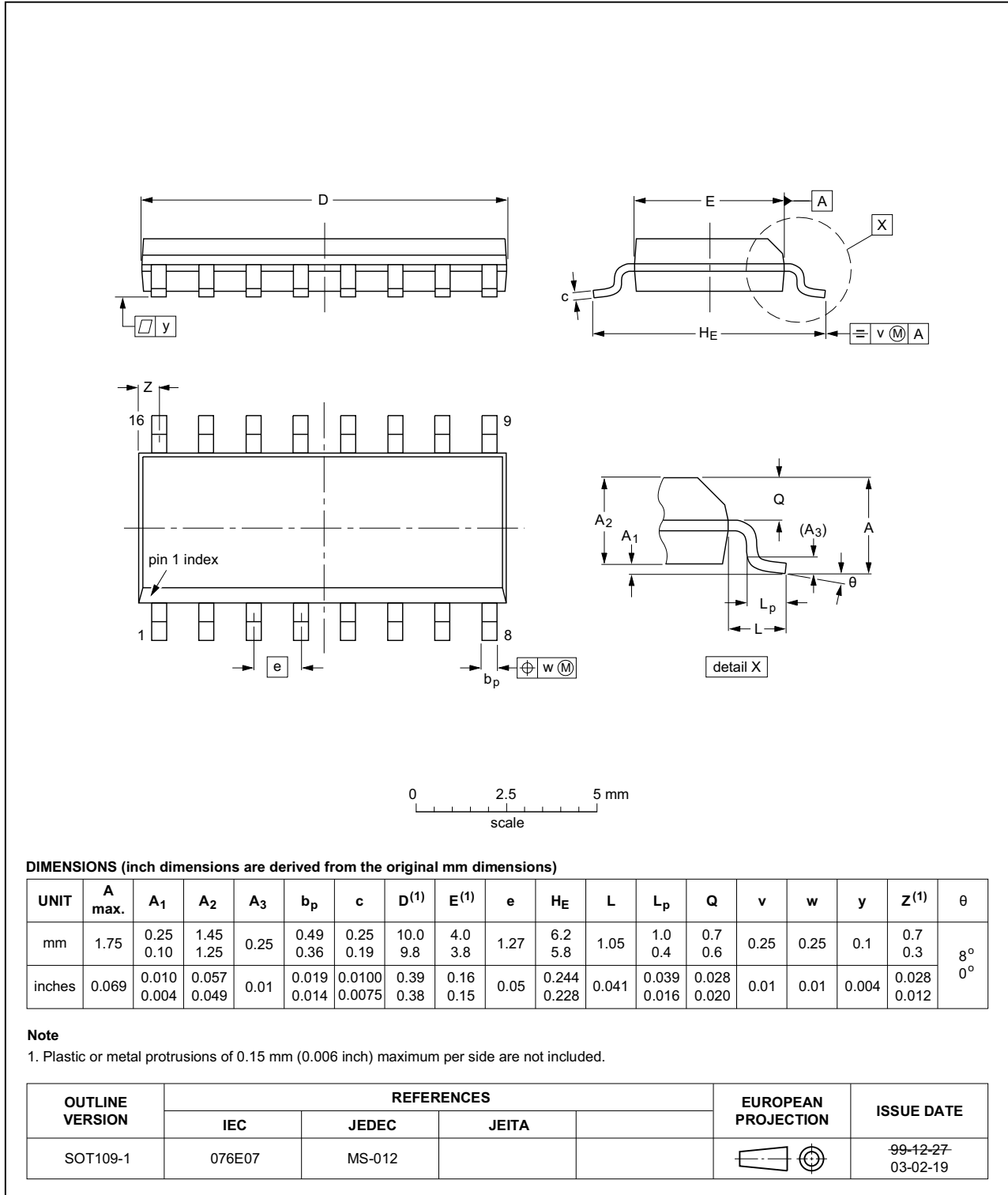


Fig 10. Package outline SOT109-1 (SO16)

SSOP16: plastic shrink small outline package; 16 leads; body width 5.3 mm

SOT338-1

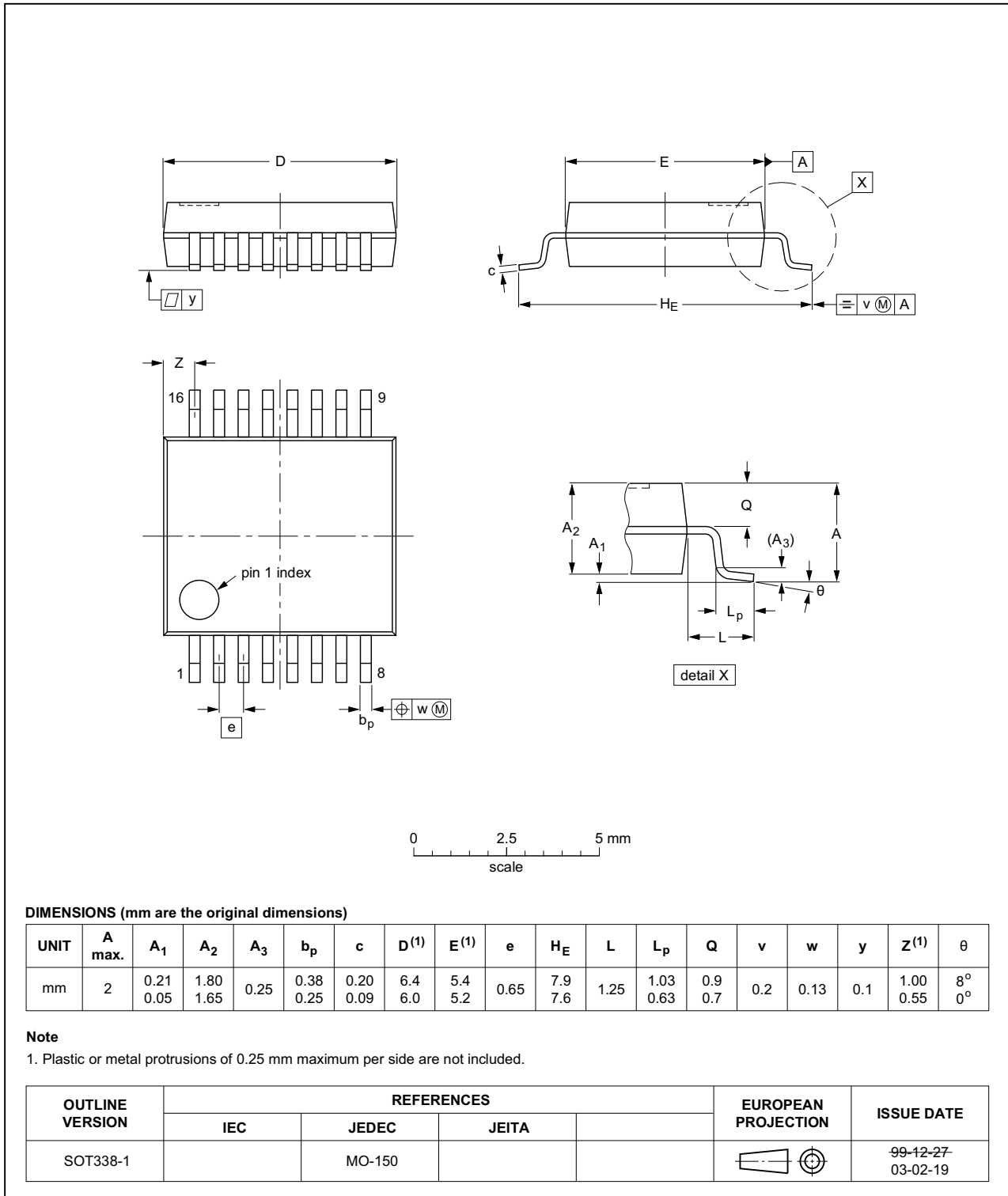


Fig 11. Package outline SOT338-1 (SSOP16)

TSSOP16: plastic thin shrink small outline package; 16 leads; body width 4.4 mm

SOT403-1

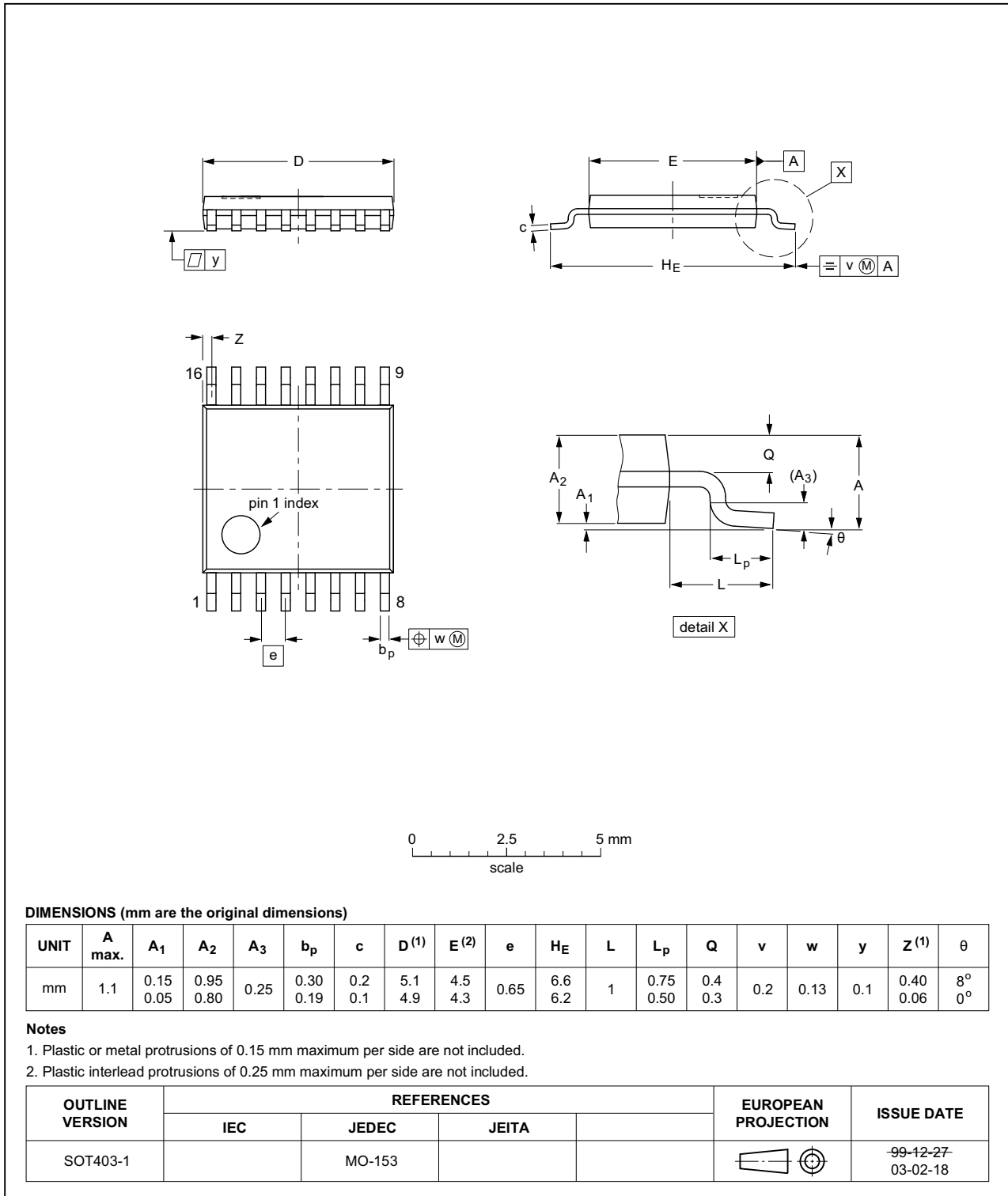


Fig 12. Package outline SOT403-1 (TSSOP16)

DHVQFN16: plastic dual in-line compatible thermal enhanced very thin quad flat package; no leads; 16 terminals; body 2.5 x 3.5 x 0.85 mm

SOT763-1

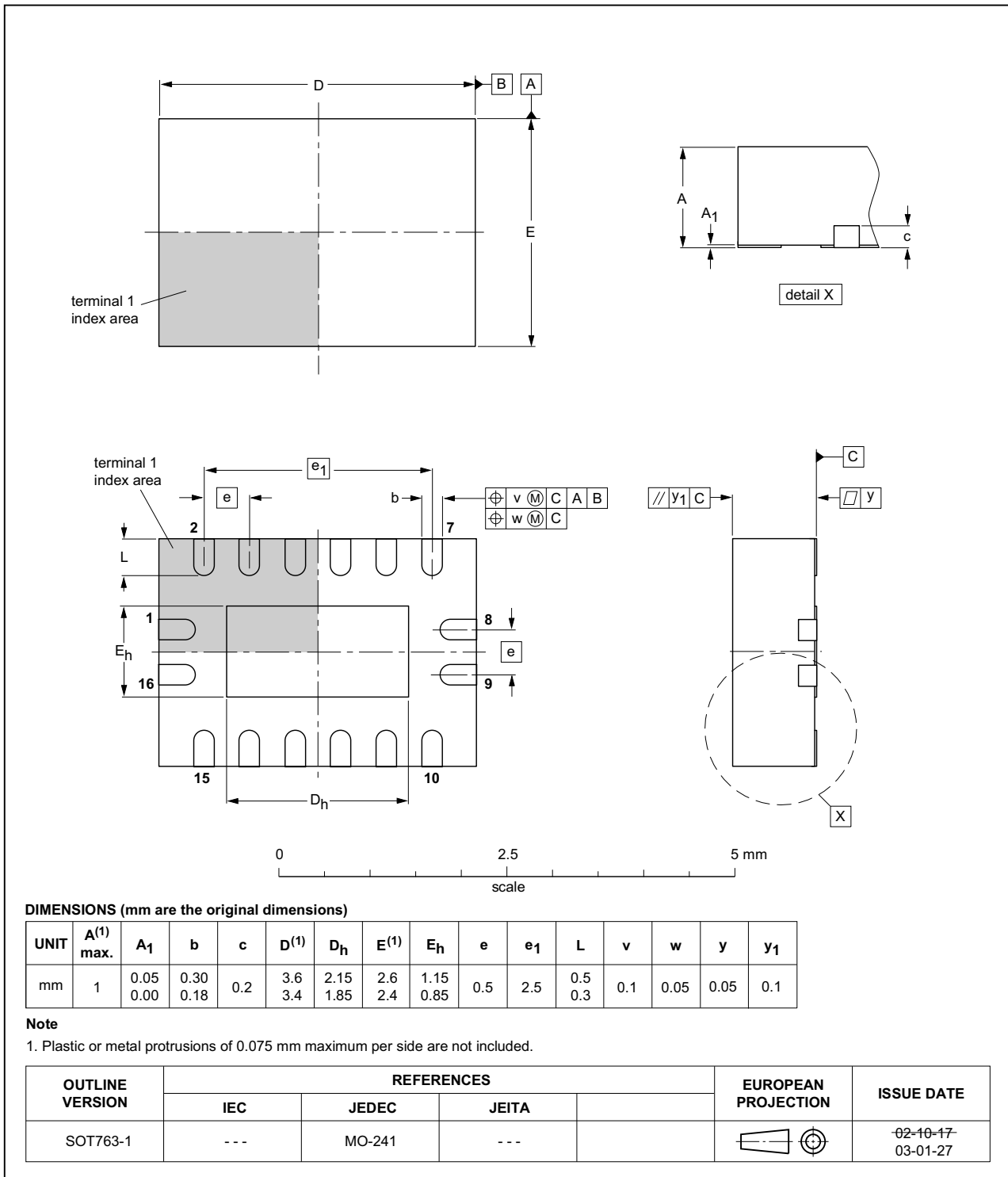


Fig 13. Package outline SOT763-1 (DHVQFN16)

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 |
|---------------------|---|-----------------------|---------------|---------------------|
| 74HC_HCT157 v.8 | 20151228 | Product data sheet | - | 74HC_HCT157 v.7 |
| Modifications: | <ul style="list-style-type: none"> Type numbers 74HC157N and 74HCT157N (SOT38-4) removed. | | | |
| 74HC_HCT157 v.7 | 20150121 | Product data sheet | - | 74HC_HCT157 v.6 |
| Modifications: | <ul style="list-style-type: none"> Table 7: Power dissipation capacitance condition for 74HCT157 is corrected. | | | |
| 74HC_HCT157 v.6 | 20120827 | Product data sheet | - | 74HC_HCT157 v.5 |
| Modifications: | <ul style="list-style-type: none"> Package outline drawing DIP16 added. | | | |
| 74HC_HCT157 v.5 | 20120425 | Product data sheet | - | 74HC_HCT157 v.4 |
| Modifications: | <ul style="list-style-type: none"> Figure 7 updated with transition times. | | | |
| 74HC_HCT157 v.4 | 20111219 | Product data sheet | - | 74HC_HCT157 v.3 |
| 74HC_HCT157 v.3 | 20101231 | Product data sheet | - | 74HC_HCT157_CNV v.2 |
| 74HC_HCT157_CNV v.2 | 19970827 | 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.nexperia.com>.

15.2 Definitions

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16. Contact information

For more information, please visit: <http://www.nexperia.com>

For sales office addresses, please send an email to: salesaddresses@nexperia.com

17. Contents

| | | |
|-----------|---|-----------|
| 1 | General description | 1 |
| 2 | Features and benefits | 1 |
| 3 | Ordering information | 2 |
| 4 | Functional diagram | 2 |
| 5 | Pinning information | 3 |
| 5.1 | Pinning | 3 |
| 5.2 | Pin description | 4 |
| 6 | Functional description | 4 |
| 7 | Limiting values | 4 |
| 8 | Recommended operating conditions | 5 |
| 9 | Static characteristics | 5 |
| 10 | Dynamic characteristics | 7 |
| 11 | Waveforms | 8 |
| 12 | Package outline | 11 |
| 13 | Abbreviations | 15 |
| 14 | Revision history | 15 |
| 15 | Legal information | 16 |
| 15.1 | Data sheet status | 16 |
| 15.2 | Definitions | 16 |
| 15.3 | Disclaimers | 16 |
| 15.4 | Trademarks | 17 |
| 16 | Contact information | 17 |
| 17 | Contents | 18 |

Компания «Life Electronics» занимается поставками электронных компонентов импортного и отечественного производства от производителей и со складов крупных дистрибьюторов Европы, Америки и Азии.

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- Оценку стоимости проекта по компонентам.
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