

74HC1G32-Q100; 74HCT1G32-Q100

2-input OR gate

Rev. 1 — 8 August 2012

Product data sheet

1. General description

74HC1G32-Q100 and 74HCT1G32-Q100 are high-speed Si-gate CMOS devices. They provide a 2-input OR function.

The standard output currents are half of those of the 74HC32-Q100 and 74HCT32-Q100.

This product has been qualified to the Automotive Electronics Council (AEC) standard Q100 (Grade 1) and is suitable for use in automotive applications.

2. Features and benefits

- Automotive product qualification in accordance with AEC-Q100 (Grade 1)
 - ◆ Specified from $-40\text{ }^{\circ}\text{C}$ to $+85\text{ }^{\circ}\text{C}$ and from $-40\text{ }^{\circ}\text{C}$ to $+125\text{ }^{\circ}\text{C}$
- Input levels:
 - ◆ For 74HC1G32-Q100: CMOS level
 - ◆ For 74HCT1G32-Q100: TTL level
- Symmetrical output impedance
- High noise immunity
- Low power dissipation
- Balanced propagation delays
- ESD protection:
 - ◆ MIL-STD-883, method 3015 exceeds 2000 V
 - ◆ HBM JESD22-A114F exceeds 2000 V
 - ◆ MM JESD22-A115-A exceeds 200 V ($C = 200\text{ pF}$, $R = 0\text{ }\Omega$)
- SOT353-1 and SOT753 package options

3. Ordering information

Table 1. Ordering information

| Type number | Package | | | Version |
|------------------|---|--------|--|----------|
| | Temperature range | Name | Description | |
| 74HC1G32GW-Q100 | $-40\text{ }^{\circ}\text{C}$ to $+125\text{ }^{\circ}\text{C}$ | TSSOP5 | plastic thin shrink small outline package; 5 leads; body width 1.25 mm | SOT353-1 |
| 74HCT1G32GW-Q100 | | | | |
| 74HC1G32GV-Q100 | $-40\text{ }^{\circ}\text{C}$ to $+125\text{ }^{\circ}\text{C}$ | SC-74A | plastic surface-mounted package; 5 leads | SOT753 |
| 74HCT1G32GV-Q100 | | | | |

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4. Marking

Table 2. Marking codes

| Type number | Marking code ^[1] |
|------------------|-----------------------------|
| 74HC1G32GW-Q100 | HG |
| 74HCT1G32GW-Q100 | TG |
| 74HC1G32GV-Q100 | H32 |
| 74HCT1G32GV-Q100 | T32 |

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

5. Functional diagram

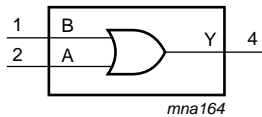


Fig 1. Logic symbol

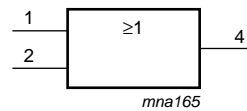


Fig 2. IEC logic symbol

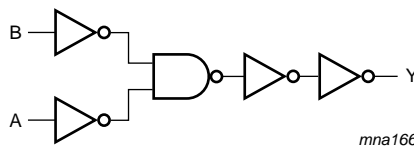


Fig 3. Logic diagram

6. Pinning information

6.1 Pinning

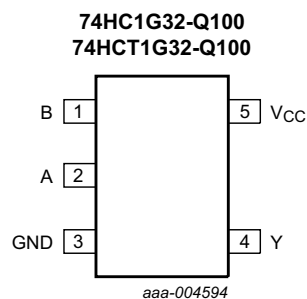


Fig 4. Pin configuration

6.2 Pin description

Table 3. Pin description

| Symbol | Pin | Description |
|-----------------|-----|----------------|
| B | 1 | data input B |
| A | 2 | data input A |
| GND | 3 | ground (0 V) |
| Y | 4 | data output Y |
| V _{CC} | 5 | supply voltage |

7. Functional description

Table 4. Function table

H = HIGH voltage level; L = LOW voltage level

| Inputs | | Output |
|--------|---|--------|
| A | B | Y |
| L | L | L |
| L | H | H |
| H | L | H |
| H | H | H |

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). [\[1\]](#)

| 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 | - | ±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 | -0.5 V < V _O < V _{CC} + 0.5 V | - | ±12.5 | mA |
| I _{CC} | supply current | | - | 25 | mA |
| I _{GND} | ground current | | -25 | - | mA |
| T _{stg} | storage temperature | | -65 | +150 | °C |
| P _{tot} | total power dissipation | T _{amb} = -40 °C to +125 °C | [2] - | 200 | mW |

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

[2] Above 55 °C the value of P_{tot} derates linearly with 2.5 mW/K.

9. Recommended operating conditions

Table 6. Recommended operating conditions

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

| Symbol | Parameter | Conditions | 74HC1G32-Q100 | | | 74HCT1G32-Q100 | | | 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 | - | - | 139 | - | - | 139 | ns/V |
| | | V _{CC} = 6.0 V | - | - | 83 | - | - | - | ns/V |

10. Static characteristics

Table 7. Static characteristics

Voltages are referenced to GND (ground = 0 V). All typical values are measured at T_{amb} = 25 °C.

| Symbol | Parameter | Conditions | -40 °C to +85 °C | | | -40 °C to +125 °C | | Unit |
|----------------------|---------------------------|--|------------------|------|------|-------------------|------|------|
| | | | Min | Typ | Max | Min | Max | |
| 74HC1G32-Q100 | | | | | | | | |
| V _{IH} | HIGH-level input voltage | V _{CC} = 2.0 V | 1.5 | 1.2 | - | 1.5 | - | V |
| | | V _{CC} = 4.5 V | 3.15 | 2.4 | - | 3.15 | - | V |
| | | V _{CC} = 6.0 V | 4.2 | 3.2 | - | 4.2 | - | V |
| V _{IL} | LOW-level input voltage | V _{CC} = 2.0 V | - | 0.8 | 0.5 | - | 0.5 | V |
| | | V _{CC} = 4.5 V | - | 2.1 | 1.35 | - | 1.35 | V |
| | | V _{CC} = 6.0 V | - | 2.8 | 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 | - | V |
| | | I _O = -20 μA; V _{CC} = 4.5 V | 4.4 | 4.5 | - | 4.4 | - | V |
| | | I _O = -20 μA; V _{CC} = 6.0 V | 5.9 | 6.0 | - | 5.9 | - | V |
| | | I _O = -2.0 mA; V _{CC} = 4.5 V | 4.13 | 4.32 | - | 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 | V |
| | | I _O = 20 μA; V _{CC} = 4.5 V | - | 0 | 0.1 | - | 0.1 | V |
| | | I _O = 20 μA; V _{CC} = 6.0 V | - | 0 | 0.1 | - | 0.1 | V |
| | | I _O = 2.0 mA; V _{CC} = 4.5 V | - | 0.15 | 0.33 | - | 0.4 | V |
| | | I _O = 2.6 mA; V _{CC} = 6.0 V | - | 0.16 | 0.33 | - | 0.4 | V |
| I _I | input leakage current | V _I = V _{CC} or GND; V _{CC} = 6.0 V | - | - | 1.0 | - | 1.0 | μA |
| I _{CC} | supply current | V _I = V _{CC} or GND; I _O = 0 A; V _{CC} = 6.0 V | - | - | 10 | - | 20 | μA |
| C _I | input capacitance | | - | 1.5 | - | - | - | pF |

Table 7. Static characteristics ...continued

Voltages are referenced to GND (ground = 0 V). All typical values are measured at $T_{amb} = 25\text{ °C}$.

| Symbol | Parameter | Conditions | -40 °C to +85 °C | | | -40 °C to +125 °C | | Unit |
|-----------------------|---------------------------|---|------------------|------|------|-------------------|-----|---------------|
| | | | Min | Typ | Max | Min | Max | |
| 74HCT1G32-Q100 | | | | | | | | |
| V_{IH} | HIGH-level input voltage | $V_{CC} = 4.5\text{ V to }5.5\text{ V}$ | 2.0 | 1.6 | - | 2.0 | - | V |
| V_{IL} | LOW-level input voltage | $V_{CC} = 4.5\text{ V to }5.5\text{ V}$ | - | 1.2 | 0.8 | - | 0.8 | V |
| V_{OH} | HIGH-level output voltage | $V_I = V_{IH}$ or V_{IL} ; $V_{CC} = 4.5\text{ V}$ | | | | | | |
| | | $I_O = -20\text{ }\mu\text{A}$ | 4.4 | 4.5 | - | 4.4 | - | V |
| | | $I_O = -2.0\text{ mA}$ | 4.13 | 4.32 | - | 3.7 | - | V |
| V_{OL} | LOW-level output voltage | $V_I = V_{IH}$ or V_{IL} ; $V_{CC} = 4.5\text{ V}$ | | | | | | |
| | | $I_O = 20\text{ }\mu\text{A}$ | - | 0 | 0.1 | - | 0.1 | V |
| | | $I_O = 2.0\text{ mA}$ | - | 0.15 | 0.33 | - | 0.4 | V |
| I_I | input leakage current | $V_I = V_{CC}$ or GND; $V_{CC} = 5.5\text{ V}$ | - | - | 1.0 | - | 1.0 | μA |
| I_{CC} | supply current | $V_I = V_{CC}$ or GND; $I_O = 0\text{ A}$; $V_{CC} = 5.5\text{ V}$ | - | - | 10 | - | 20 | μA |
| ΔI_{CC} | additional supply current | per input; $V_{CC} = 4.5\text{ V to }5.5\text{ V}$; $V_I = V_{CC} - 2.1\text{ V}$; $I_O = 0\text{ A}$ | - | - | 500 | - | 850 | μA |
| C_I | input capacitance | | - | 1.5 | - | - | - | pF |

11. Dynamic characteristics

Table 8. Dynamic characteristics

$GND = 0\text{ V}$; $t_r = t_f \leq 6.0\text{ ns}$. All typical values are measured at $T_{amb} = 25\text{ °C}$. For test circuit see [Figure 6](#)

| Symbol | Parameter | Conditions | -40 °C to +85 °C | | | -40 °C to +125 °C | | Unit |
|----------------------|-------------------------------|--|------------------|-----|-----|-------------------|-----|------|
| | | | Min | Typ | Max | Min | Max | |
| 74HC1G32-Q100 | | | | | | | | |
| t_{pd} | propagation delay | A and B to Y; see Figure 5 | | | | | | |
| | | $V_{CC} = 2.0\text{ V}$; $C_L = 50\text{ pF}$ | - | 18 | 115 | - | 135 | ns |
| | | $V_{CC} = 4.5\text{ V}$; $C_L = 50\text{ pF}$ | - | 8 | 23 | - | 27 | ns |
| | | $V_{CC} = 5.0\text{ V}$; $C_L = 15\text{ pF}$ | - | 8 | - | - | - | ns |
| | | $V_{CC} = 6.0\text{ V}$; $C_L = 50\text{ pF}$ | - | 7 | 20 | - | 23 | ns |
| C_{PD} | power dissipation capacitance | $V_I = GND$ to V_{CC} | - | 19 | - | - | - | pF |

Table 8. Dynamic characteristics ...continued

$GND = 0\text{ V}$; $t_r = t_f \leq 6.0\text{ ns}$. All typical values are measured at $T_{amb} = 25\text{ }^\circ\text{C}$. For test circuit see [Figure 6](#)

| Symbol | Parameter | Conditions | -40 °C to +85 °C | | | -40 °C to +125 °C | | Unit |
|-----------------------|-------------------------------|--|---------------------|-----|-----|-------------------|-----|------|
| | | | Min | Typ | Max | Min | Max | |
| 74HCT1G32-Q100 | | | | | | | | |
| t_{pd} | propagation delay | A and B to Y; see Figure 5 | [1] | | | | | |
| | | $V_{CC} = 4.5\text{ V}$; $C_L = 50\text{ pF}$ | - | 10 | 24 | - | 27 | ns |
| | | $V_{CC} = 5.0\text{ V}$; $C_L = 15\text{ pF}$ | - | 10 | - | - | - | ns |
| C_{PD} | power dissipation capacitance | $V_I = GND\text{ to }V_{CC} - 1.5\text{ V}$ | [2] | | | | | |
| | | | - | 20 | - | - | - | pF |

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

[2] C_{PD} is used to determine the dynamic power dissipation P_D (μW).

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

f_i = input frequency in MHz

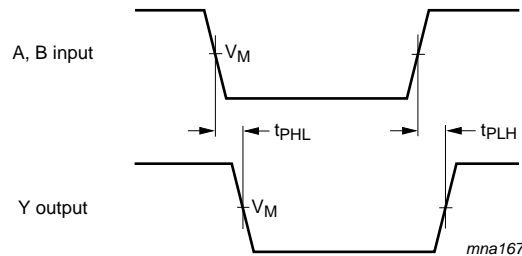
f_o = output frequency in MHz

C_L = output load capacitance in pF

V_{CC} = supply voltage in V

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

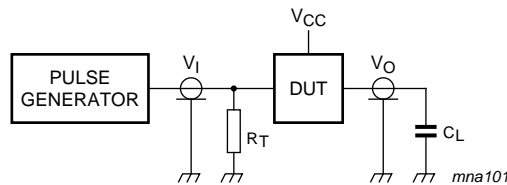
12. Waveforms



For 74HC1G32-Q100: $V_M = 0.5 \times V_{CC}$; $V_I = GND\text{ to }V_{CC}$

For 74HCT1G32-Q100: $V_M = 1.3\text{ V}$; $V_I = GND\text{ to }3.0\text{ V}$

Fig 5. The input (A and B) to output (Y) propagation delays



Measurement points are given in [Table 8](#). Definitions for test circuit:

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.

Fig 6. Load circuitry for switching times

13. Package outline

TSSOP5: plastic thin shrink small outline package; 5 leads; body width 1.25 mm

SOT353-1

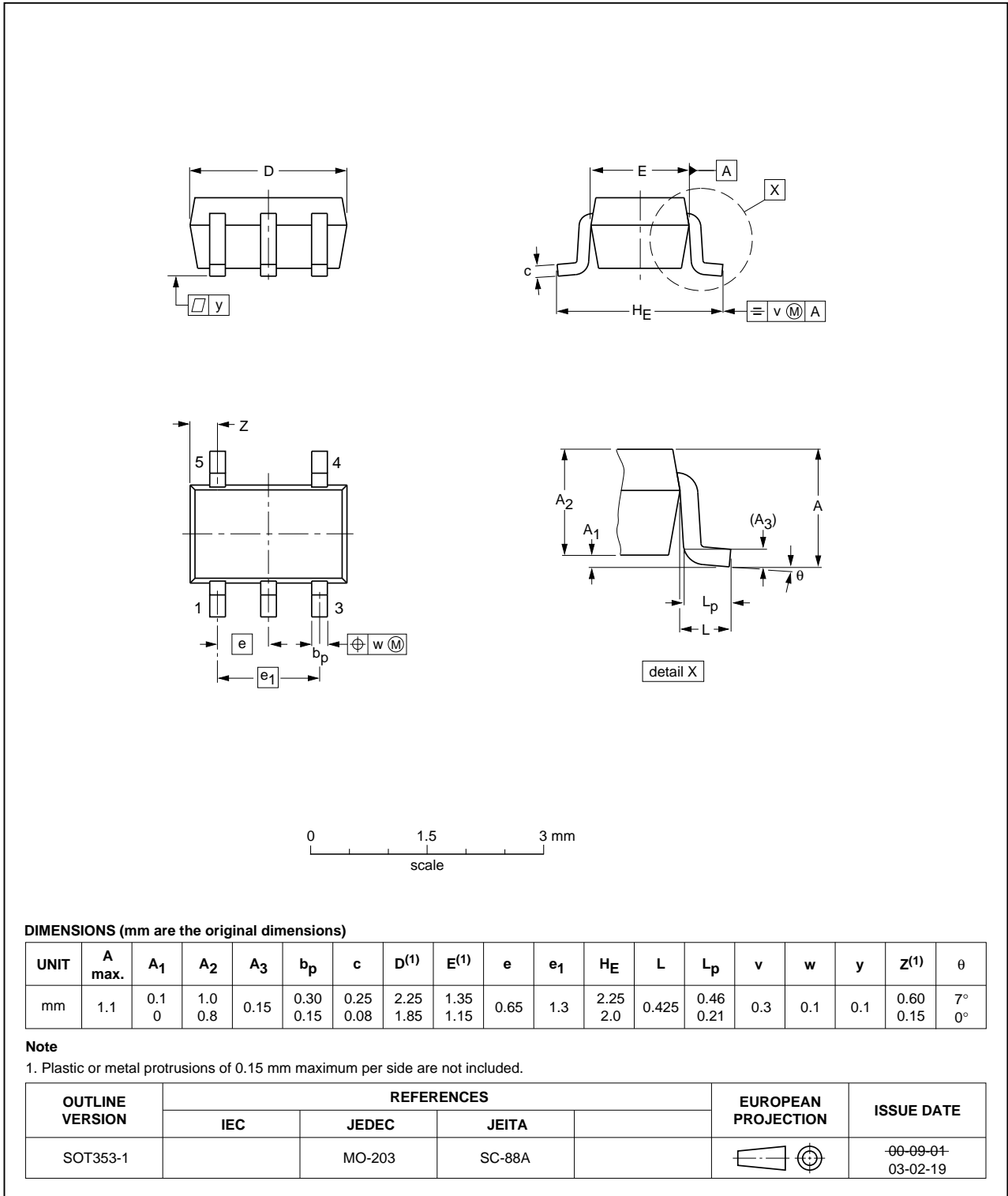


Fig 7. Package outline SOT353-1 (TSSOP5)

Plastic surface-mounted package; 5 leads

SOT753

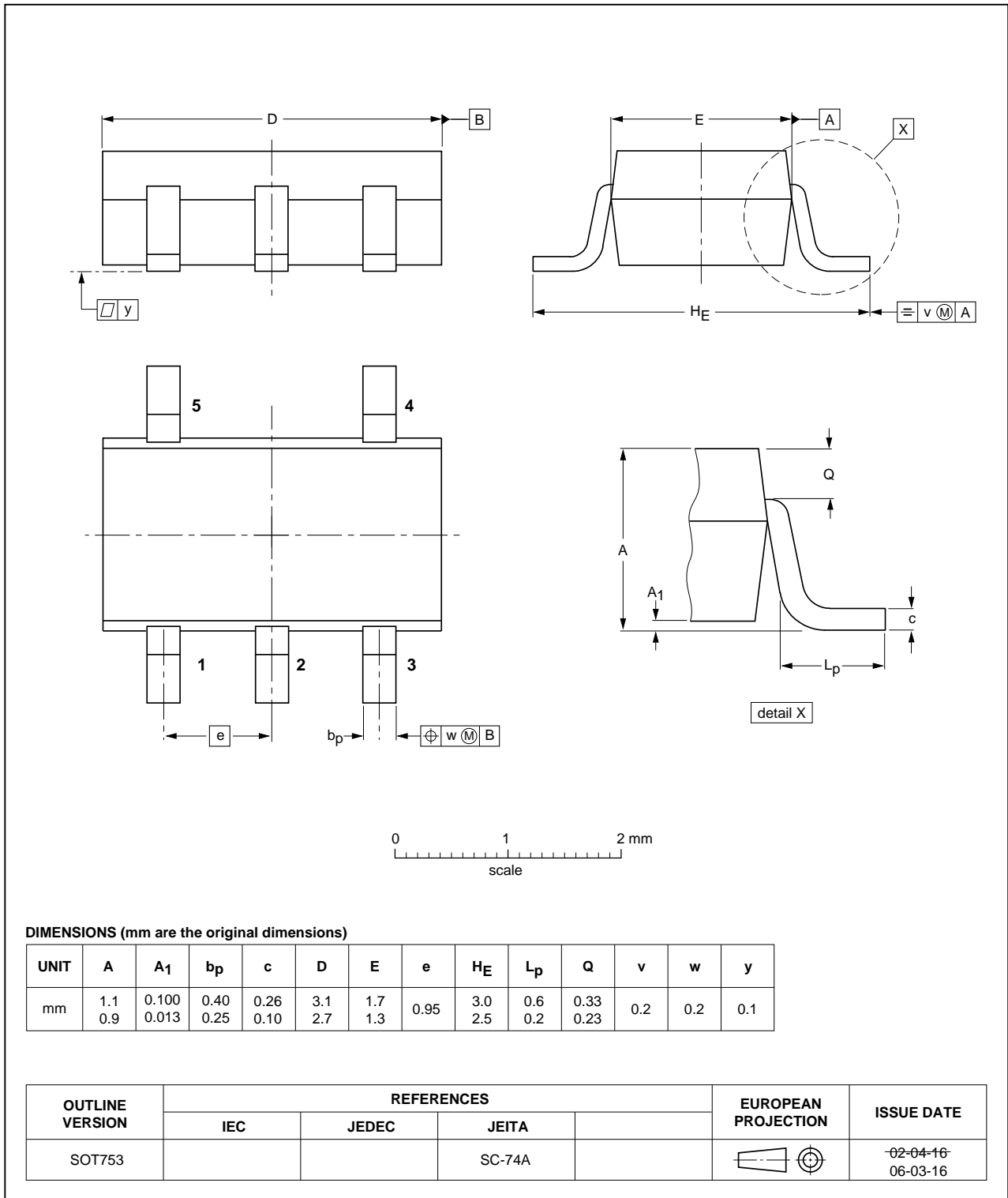


Fig 8. Package outline SOT753 (SC-74A)

14. Abbreviations

Table 9. Abbreviations

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

15. Revision history

Table 10. Revision history

| Document ID | Release date | Data sheet status | Change notice | Supersedes |
|-----------------------|--------------|--------------------|---------------|------------|
| 74HC_HCT1G32_Q100 v.1 | 20120808 | Product data sheet | - | - |

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16.1 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. |
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[2] The term 'short data sheet' is explained in section "Definitions".

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