

# 74HC3G07-Q100; 74HCT3G07-Q100

Triple buffer with open-drain outputs

Rev. 2 — 11 December 2013

Product data sheet

## 1. General description

The 74HC3G07-Q100; 74HCT3G07-Q100 is a triple buffer with open-drain outputs. Inputs include clamp diodes that enable the use of current limiting resistors to interface inputs to voltages in excess of  $V_{CC}$ .

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 74HC3G07-Q100: CMOS level
  - ◆ For 74HCT3G07-Q100: TTL level
- Complies with JEDEC standard no. 7 A
- Wide supply voltage range from 2.0 V to 6.0 V
- 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 ( $C = 200\text{ pF}$ ,  $R = 0\text{ }\Omega$ )
- Multiple package options

## 3. Ordering information

Table 1. Ordering information

| Type number                         | Package   |        |  |          |
|-------------------------------------|---|--------|--|----------|
|                                     | Temperature range   | Name   | Description  | Version  |
| 74HC3G07DP-Q100<br>74HCT3G07DP-Q100 | $-40\text{ }^{\circ}\text{C}$ to $+125\text{ }^{\circ}\text{C}$ | TSSOP8 | plastic thin shrink small outline package; 8 leads;<br>body width 3 mm; lead length 0.5 mm | SOT505-2 |
| 74HC3G07DC-Q100<br>74HCT3G07DC-Q100 | $-40\text{ }^{\circ}\text{C}$ to $+125\text{ }^{\circ}\text{C}$ | VSSOP8 | plastic very thin shrink small outline package; 8 leads;<br>body width 2.3 mm              | SOT765-1 |



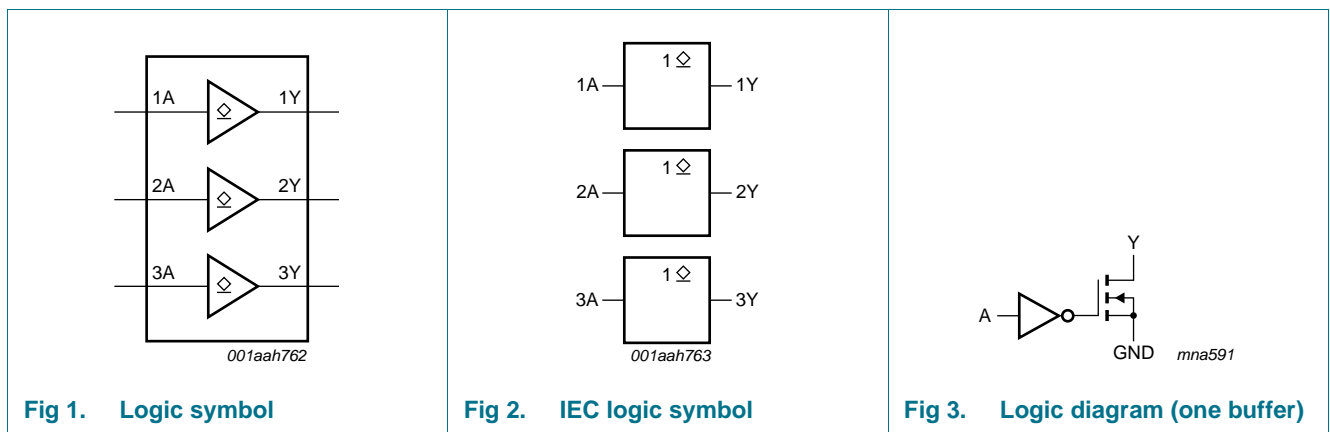
## 4. Marking

Table 2. Marking code

| Type number      | Marking code <sup>[1]</sup> |
|------------------|-----------------------------|
| 74HC3G07DP-Q100  | H07                         |
| 74HCT3G07DP-Q100 | T07                         |
| 74HC3G07DC-Q100  | H07                         |
| 74HCT3G07DC-Q100 | T07                         |

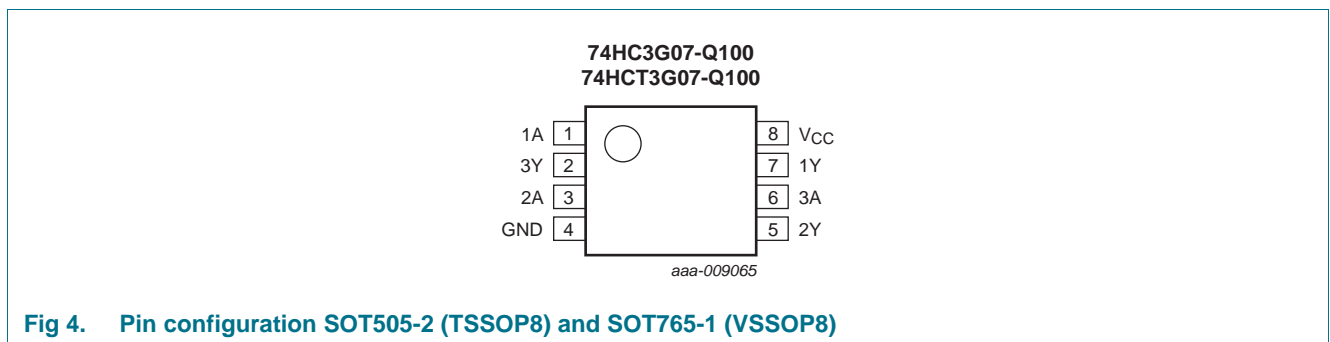
[1] The pin 1 indicator is located on the lower left corner of the device, below the marking code.

## 5. Functional diagram



## 6. Pinning information

### 6.1 Pinning



## 6.2 Pin description

**Table 3.** Pin description

| Symbol          | Pin     | Description    |
|-----------------|---------|----------------|
| 1A, 2A, 3A      | 1, 3, 6 | data input     |
| GND             | 4       | ground (0 V)   |
| 1Y, 2Y, 3Y      | 7, 5, 2 | data output    |
| V <sub>CC</sub> | 8       | supply voltage |

## 7. Functional description

**Table 4.** Function table<sup>[1]</sup>

| Input nA | Output nY |
|----------|-----------|
| L        | L         |
| H        | Z         |

[1] H = HIGH voltage level; L = LOW voltage level; Z = high-impedance OFF-state.

## 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).

| Symbol           | Parameter                 | Conditions  | Min                 | Max                   | Unit |
|------------------|---------------------------|---|---------------------|-----------------------|------|
| V <sub>CC</sub>  | supply voltage            |   | -0.5                | 7.0                   | V    |
| I <sub>IK</sub>  | input clamping current    | V <sub>I</sub> < -0.5 V or V <sub>I</sub> > V <sub>CC</sub> + 0.5 V | <sup>[1]</sup> -    | ±20                   | mA   |
| I <sub>OK</sub>  | output clamping current   | V <sub>O</sub> < -0.5 V   | <sup>[1]</sup> -20  | -                     | mA   |
| V <sub>O</sub>   | output voltage            | active mode   | <sup>[1]</sup> -0.5 | V <sub>CC</sub> + 0.5 | V    |
|                  |                           | high-impedance mode   | <sup>[1]</sup> -0.5 | 7.0                   | V    |
| I <sub>O</sub>   | output current            | V <sub>O</sub> = -0.5 V to 7.0 V                                    | <sup>[1]</sup> -25  | -                     | mA   |
| I <sub>CC</sub>  | supply current            |   | <sup>[1]</sup> -    | 50                    | mA   |
| I <sub>GND</sub> | ground current            |   | <sup>[1]</sup> -50  | -                     | mA   |
| T <sub>stg</sub> | storage temperature       |   | -65                 | +150                  | °C   |
| P <sub>D</sub>   | dynamic power dissipation | T <sub>amb</sub> = -40 °C to +125 °C                                | <sup>[2]</sup> -    | 300                   | mW   |

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

[2] For TSSOP8 package: above 55 °C the value of P<sub>tot</sub> derates linearly with 2.5 mW/K.  
For VSSOP8 package: above 110 °C the value of P<sub>tot</sub> derates linearly with 8 mW/K.

## 9. Recommended operating conditions

**Table 6. Recommended operating conditions**

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

| Symbol           | Parameter                           | Conditions              | 74HC3G07-Q100 |      |                 | 74HCT3G07-Q100 |      |                 | Unit |
|------------------|-------------------------------------|-------------------------|---------------|------|-----------------|----------------|------|-----------------|------|
|                  |                                     |                         | Min           | Typ  | Max             | Min            | Typ  | Max             |      |
| V <sub>CC</sub>  | supply voltage                      |                         | 2.0           | 5.0  | 6.0             | 4.5            | 5.0  | 5.5             | V    |
| V <sub>I</sub>   | input voltage                       |                         | 0             | -    | 6.0             | 0              | -    | 5.5             | V    |
| V <sub>O</sub>   | output voltage                      |                         | 0             | -    | V <sub>CC</sub> | 0              | -    | V <sub>CC</sub> | V    |
| T <sub>amb</sub> | ambient temperature                 |                         | -40           | +25  | +125            | -40            | +25  | +125            | °C   |
| Δt/ΔV            | input transition rise and fall rate | V <sub>CC</sub> = 2.0 V | -             | -    | 625             | -              | -    | -               | ns/V |
|                  |                                     | V <sub>CC</sub> = 4.5 V | -             | 1.67 | 139             | -              | 1.67 | 139             | ns/V |
|                  |                                     | V <sub>CC</sub> = 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<sub>amb</sub> = 25 °C.

| Symbol               | Parameter                | Conditions   | -40 °C to +85 °C |                    |      | -40 °C to +125 °C |      | Unit |
|----------------------|--------------------------|--|------------------|--------------------|------|-------------------|------|------|
|                      |                          |  | Min              | Typ <sup>[1]</sup> | Max  | Min               | Max  |      |
| <b>74HC3G07-Q100</b> |                          |  |                  |                    |      |                   |      |      |
| V <sub>IH</sub>      | HIGH-level input voltage | V <sub>CC</sub> = 2.0 V  | 1.5              | 1.2                | -    | 1.5               | -    | V    |
|                      |                          | V <sub>CC</sub> = 4.5 V  | 3.15             | 2.4                | -    | 3.15              | -    | V    |
|                      |                          | V <sub>CC</sub> = 6.0 V  | 4.2              | 3.2                | -    | 4.2               | -    | V    |
| V <sub>IL</sub>      | LOW-level input voltage  | V <sub>CC</sub> = 2.0 V  | -                | 0.8                | 0.5  | -                 | 0.5  | V    |
|                      |                          | V <sub>CC</sub> = 4.5 V  | -                | 2.1                | 1.35 | -                 | 1.35 | V    |
|                      |                          | V <sub>CC</sub> = 6.0 V  | -                | 2.8                | 1.8  | -                 | 1.8  | V    |
| V <sub>OL</sub>      | LOW-level output voltage | V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>  |                  |                    |      |                   |      |      |
|                      |                          | I <sub>O</sub> = 20 μA; V <sub>CC</sub> = 2.0 V  | -                | 0                  | 0.1  | -                 | 0.1  | V    |
|                      |                          | I <sub>O</sub> = 20 μA; V <sub>CC</sub> = 4.5 V  | -                | 0                  | 0.1  | -                 | 0.1  | V    |
|                      |                          | I <sub>O</sub> = 20 μA; V <sub>CC</sub> = 6.0 V  | -                | 0                  | 0.1  | -                 | 0.1  | V    |
|                      |                          | I <sub>O</sub> = 4.0 mA; V <sub>CC</sub> = 4.5 V   | -                | 0.15               | 0.33 | -                 | 0.4  | V    |
|                      |                          | I <sub>O</sub> = 5.2 mA; V <sub>CC</sub> = 6.0 V   | -                | 0.16               | 0.33 | -                 | 0.4  | V    |
| I <sub>I</sub>       | input leakage current    | V <sub>I</sub> = V <sub>CC</sub> or GND; V <sub>CC</sub> = 6.0 V                                       | -                | -                  | ±0.1 | -                 | ±1.0 | μA   |
| I <sub>LO</sub>      | output leakage current   | V <sub>I</sub> = V <sub>IH</sub> ; V <sub>O</sub> = V <sub>CC</sub> or GND                             | -                | -                  | ±5.0 | -                 | ±10  | μA   |
| I <sub>CC</sub>      | supply current           | per input pin; V <sub>CC</sub> = 6.0 V; V <sub>I</sub> = V <sub>CC</sub> or GND; I <sub>O</sub> = 0 A; | -                | -                  | 10   | -                 | 20   | μA   |
| C <sub>I</sub>       | input capacitance        |  | -                | 1.5                | -    | -                 | -    | pF   |

**Table 7. Static characteristics ...continued**

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

| Symbol                | Parameter                 | Conditions  | -40 °C to +85 °C |                    |           | -40 °C to +125 °C |           | Unit          |
|-----------------------|---------------------------|---|------------------|--------------------|-----------|-------------------|-----------|---------------|
|                       |                           |   | Min              | Typ <sup>[1]</sup> | Max       | Min               | Max       |               |
| <b>74HCT3G07-Q100</b> |                           |   |                  |                    |           |                   |           |               |
| $V_{IH}$              | 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             |
| $V_{OL}$              | LOW-level output voltage  | $V_I = V_{IH}$ or $V_{IL}$  |                  |                    |           |                   |           |               |
|                       |                           | $I_O = 20\text{ }\mu\text{A}; V_{CC} = 4.5\text{ V}$  | -                | 0                  | 0.1       | -                 | 0.1       | V             |
|                       |                           | $I_O = 4.0\text{ mA}; V_{CC} = 4.5\text{ V}$  | -                | 0.15               | 0.33      | -                 | 0.4       | V             |
| $I_I$                 | input leakage current     | $V_I = V_{CC}$ or GND; $V_{CC} = 5.5\text{ V}$  | -                | -                  | $\pm 1.0$ | -                 | $\pm 1.0$ | $\mu\text{A}$ |
| $I_{LO}$              | output leakage current    | $V_I = V_{IH}; V_O = V_{CC}$ or GND   | -                | -                  | $\pm 5.0$ | -                 | $\pm 10$  | $\mu\text{A}$ |
| $I_{CC}$              | supply current            | per input pin; $V_{CC} = 5.5\text{ V}; V_I = V_{CC}$ or GND; $I_O = 0\text{ A}$ ;                 | -                | -                  | 10        | -                 | 20        | $\mu\text{A}$ |
| $\Delta I_{CC}$       | additional supply current | per input; $V_{CC} = 4.5\text{ V to }5.5\text{ V}; V_I = V_{CC} - 2.1\text{ V}; I_O = 0\text{ A}$ | -                | -                  | 375       | -                 | 410       | $\mu\text{A}$ |
| $C_I$                 | input capacitance         |   | -                | 1.5                | -         | -                 | -         | pF            |

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

## 11. Dynamic characteristics

**Table 8. Dynamic characteristics**

Voltages are referenced to GND (ground = 0 V); 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 |      |
| <b>74HC3G07-Q100</b> |                                    |  |                  |     |     |                   |     |      |
| $t_{PZL}$            | OFF-state to LOW propagation delay | nA to nY; see <a href="#">Figure 5</a> |                  |     |     |                   |     |      |
|                      |                                    | $V_{CC} = 2.0\text{ V}$                | -                | 25  | 95  | -                 | 125 | ns   |
|                      |                                    | $V_{CC} = 4.5\text{ V}$                | -                | 9   | 19  | -                 | 25  | ns   |
|                      |                                    | $V_{CC} = 6.0\text{ V}$                | -                | 7   | 16  | -                 | 20  | ns   |
| $t_{PLZ}$            | LOW to OFF-state propagation delay | nA to nY; see <a href="#">Figure 5</a> |                  |     |     |                   |     |      |
|                      |                                    | $V_{CC} = 2.0\text{ V}$                | -                | 25  | 95  | -                 | 125 | ns   |
|                      |                                    | $V_{CC} = 4.5\text{ V}$                | -                | 11  | 23  | -                 | 30  | ns   |
|                      |                                    | $V_{CC} = 6.0\text{ V}$                | -                | 10  | 23  | -                 | 26  | ns   |
| $t_{THL}$            | HIGH to LOW output transition time | nY; see <a href="#">Figure 5</a>       |                  |     |     |                   |     |      |
|                      |                                    | $V_{CC} = 2.0\text{ V}$                | -                | 18  | 95  | -                 | 125 | ns   |
|                      |                                    | $V_{CC} = 4.5\text{ V}$                | -                | 6   | 19  | -                 | 25  | ns   |
|                      |                                    | $V_{CC} = 6.0\text{ V}$                | -                | 5   | 16  | -                 | 20  | ns   |
| $C_{PD}$             | power dissipation capacitance      | $V_I = \text{GND to } V_{CC}$          | <sup>[1]</sup>   | 4   | -   | -                 | -   | pF   |

**Table 8. Dynamic characteristics ...continued**

Voltages are referenced to GND (ground = 0 V); 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 |      |
| <b>74HCT3G07-Q100</b> |                                    |   |                  |     |     |                   |     |      |
| $t_{PZL}$             | OFF-state to LOW propagation delay | nA to nY; see <a href="#">Figure 5</a><br>$V_{CC} = 4.5\text{ V}$ | -                | 11  | 27  | -                 | 32  | ns   |
| $t_{PLZ}$             | LOW to OFF-state propagation delay | nA to nY; see <a href="#">Figure 5</a><br>$V_{CC} = 4.5\text{ V}$ | -                | 10  | 26  | -                 | 31  | ns   |
| $t_{THL}$             | HIGH to LOW output transition time | $V_{CC} = 4.5\text{ V}$ ; see <a href="#">Figure 5</a>            | -                | 6   | 19  | -                 | 22  | ns   |
| $C_{PD}$              | power dissipation capacitance      | $V_I = \text{GND to } V_{CC} - 1.5\text{ V}$ <a href="#">[1]</a>  | -                | 4   | -   | -                 | -   | pF   |

[1]  $C_{PD}$  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;

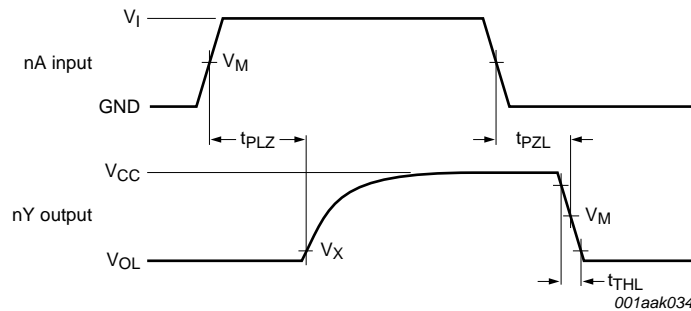
$C_L$  = output load capacitance in pF;

$V_{CC}$  = supply voltage in V;

$N$  = number of inputs switching;

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

## 12. Waveforms



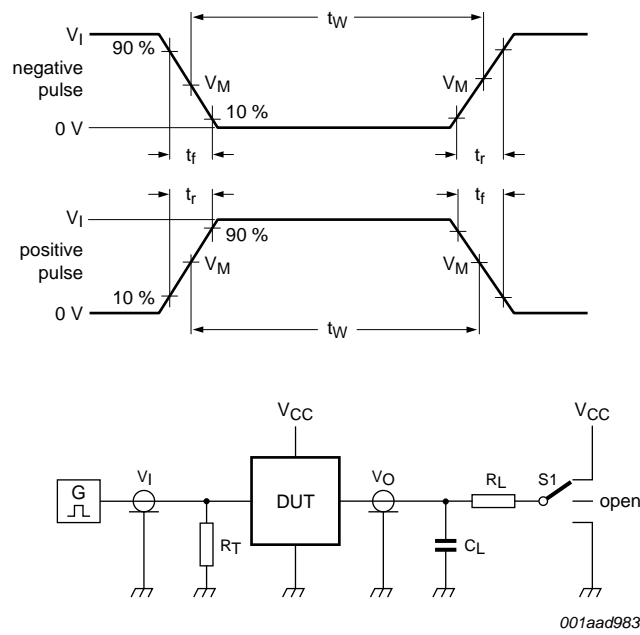
Measurement points are given in [Table 9](#).

$V_{OL}$  is the typical output voltage level that occurs with the output load.

**Fig 5. The input (nA) to output (nY) propagation delays**

**Table 9. Measurement points**

| Type           | Input               | Output              |                     |
|----------------|---------------------|---------------------|---------------------|
|                | $V_M$               | $V_M$               | $V_X$               |
| 74HC3G07-Q100  | $0.5 \times V_{CC}$ | $0.5 \times V_{CC}$ | $0.1 \times V_{CC}$ |
| 74HCT3G07-Q100 | 1.3 V               | 1.3 V               | $0.1 \times V_{CC}$ |



Test data is given in [Table 10](#).

Definitions for 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 6. Test circuit for measuring switching times**

**Table 10. Test data**

| Type           | Input           |             | Load  |              |                    | S1 position |
|----------------|-----------------|-------------|-------|--------------|--------------------|-------------|
|                | $V_I$           | $t_r, t_f$  | $C_L$ | $R_L$        | $t_{PZL}, t_{PLZ}$ |             |
| 74HC3G07-Q100  | GND to $V_{CC}$ | $\leq 6$ ns | 50 pF | 1 k $\Omega$ | $V_{CC}$           |             |
| 74HCT3G07-Q100 | GND to 3 V      | $\leq 6$ ns | 50 pF | 1 k $\Omega$ | $V_{CC}$           |             |

13. Package outline

TSSOP8: plastic thin shrink small outline package; 8 leads; body width 3 mm; lead length 0.5 mm SOT505-2

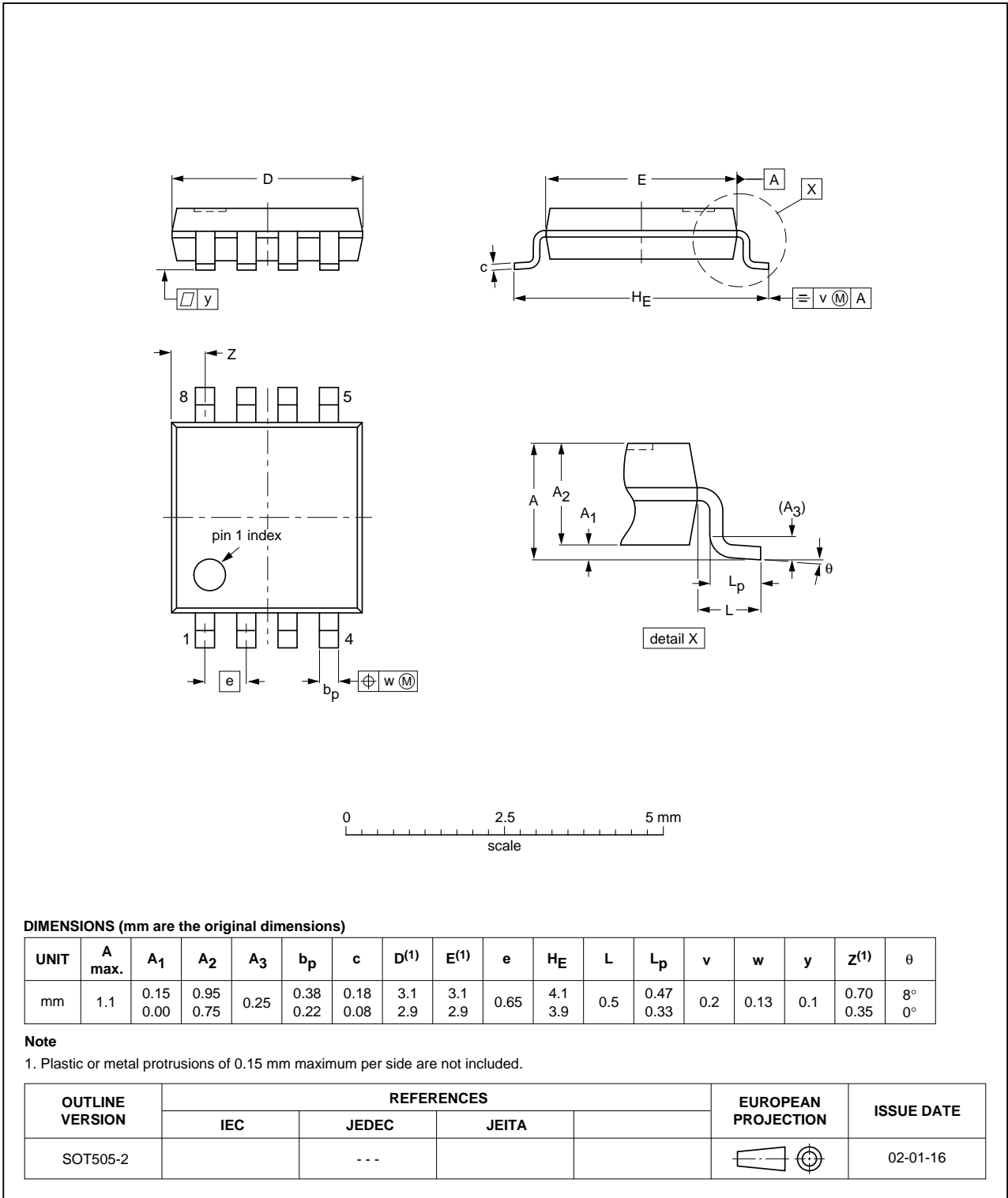


Fig 7. Package outline SOT505-2 (TSSOP8)



VSSOP8: plastic very thin shrink small outline package; 8 leads; body width 2.3 mm

SOT765-1

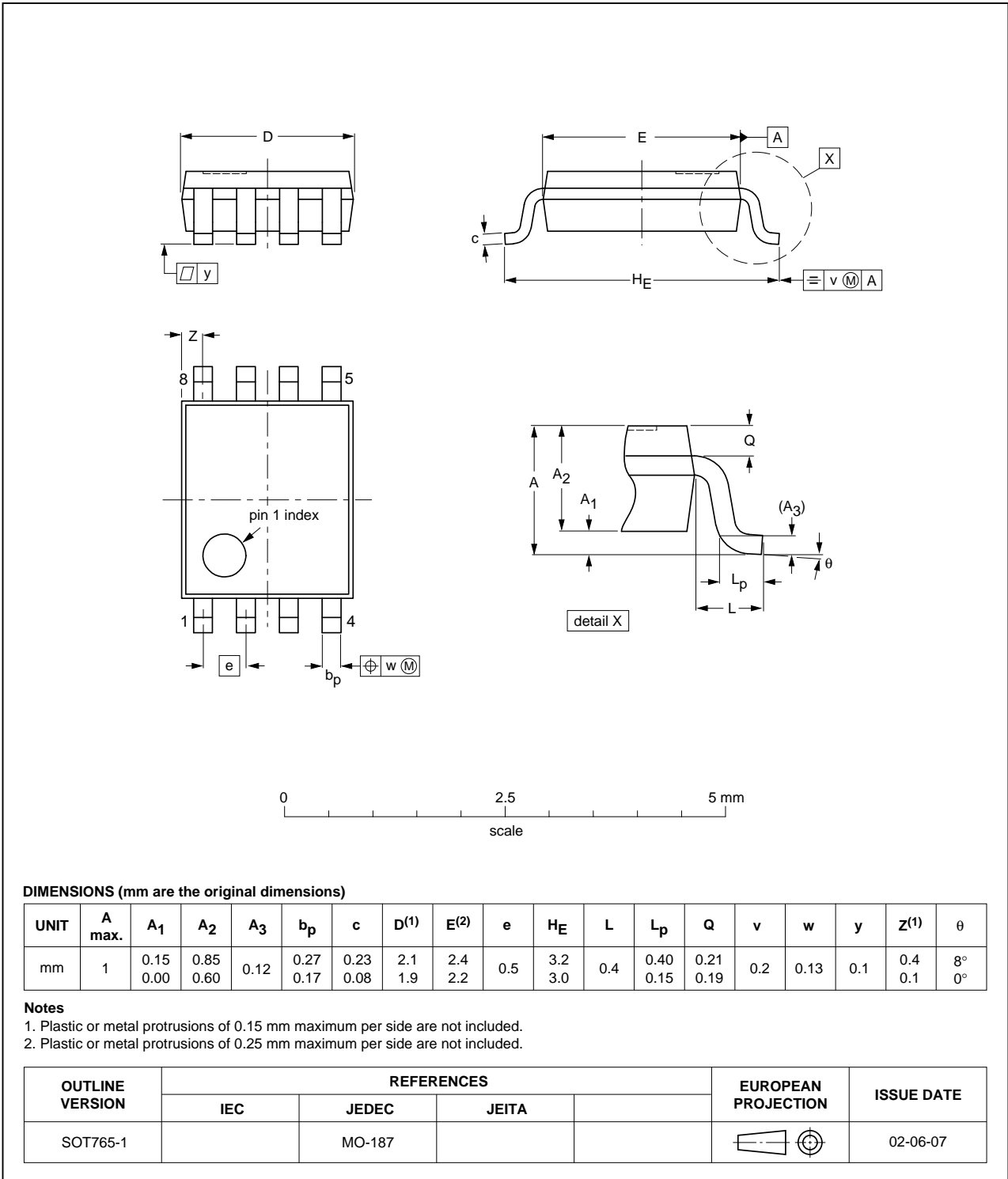


Fig 8. Package outline SOT765-1 (VSSOP8)

## 14. Abbreviations

Table 11. Abbreviations

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

## 15. Revision history

Table 12. Revision history

| Document ID           | Release date                              | Data sheet status  | Change notice | Supersedes            |
|-----------------------|---|--------------------|---------------|-----------------------|
| 74HC_HCT3G07_Q100 v.2 | 20131211                                  | Product data sheet | -             | 74HC_HCT3G07_Q100 v.1 |
| Modifications:        | • Features and benefits updated (errata). |                    |               |                       |
| 74HC_HCT3G07_Q100 v.1 | 20130917                                  | Product data sheet | -             | -                     |

## 16. Legal information

### 16.1 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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## 18. Contents

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|      |  |    |
|------|--|----|
| 1    | General description . . . . .              | 1  |
| 2    | Features and benefits . . . . .            | 1  |
| 3    | Ordering information . . . . .             | 1  |
| 4    | Marking . . . . .                          | 2  |
| 5    | Functional diagram . . . . .               | 2  |
| 6    | Pinning information . . . . .              | 2  |
| 6.1  | Pinning . . . . .                          | 2  |
| 6.2  | Pin description . . . . .                  | 3  |
| 7    | Functional description . . . . .           | 3  |
| 8    | Limiting values . . . . .                  | 3  |
| 9    | Recommended operating conditions . . . . . | 4  |
| 10   | Static characteristics . . . . .           | 4  |
| 11   | Dynamic characteristics . . . . .          | 5  |
| 12   | Waveforms . . . . .                        | 6  |
| 13   | Package outline . . . . .                  | 8  |
| 14   | Abbreviations . . . . .                    | 10 |
| 15   | Revision history . . . . .                 | 10 |
| 16   | Legal information . . . . .                | 11 |
| 16.1 | Data sheet status . . . . .                | 11 |
| 16.2 | Definitions . . . . .                      | 11 |
| 16.3 | Disclaimers . . . . .                      | 11 |
| 16.4 | Trademarks . . . . .                       | 12 |
| 17   | Contact information . . . . .              | 12 |
| 18   | Contents . . . . .                         | 13 |

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