

# 74AHC2G32; 74AHCT2G32

Dual 2-input OR gate

Rev. 4 — 18 December 2018

Product data sheet

## 1. General description

The 74AHC2G32; 74AHCT2G32 are high-speed Si-gate CMOS devices. They provide two 2-input OR gates.

The AHC device has CMOS input switching levels and supply voltage range 2 V to 5.5 V.

The AHCT device has TTL input switching levels and supply voltage range 4.5 V to 5.5 V

## 2. Features and benefits

- Symmetrical output impedance
- High noise immunity
- ESD protection:
  - HBM JESD22-A114E exceeds 2000 V
  - MM JESD22-A115-A exceeds 200 V
  - CDM JESD22-C101C exceeds 1000 V
- Low power dissipation
- Balanced propagation delays
- 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  |
| 74AHC2G32DP  | -40 °C to +125 °C | TSSOP8 | plastic thin shrink small outline package; 8 leads; body width 3 mm; lead length 0.5 mm | SOT505-2 |
| 74AHCT2G32DP |                   |        |   |          |
| 74AHC2G32DC  | -40 °C to +125 °C | VSSOP8 | plastic very thin shrink small outline package; 8 leads; body width 2.3 mm              | SOT765-1 |
| 74AHCT2G32DC |                   |        |   |          |

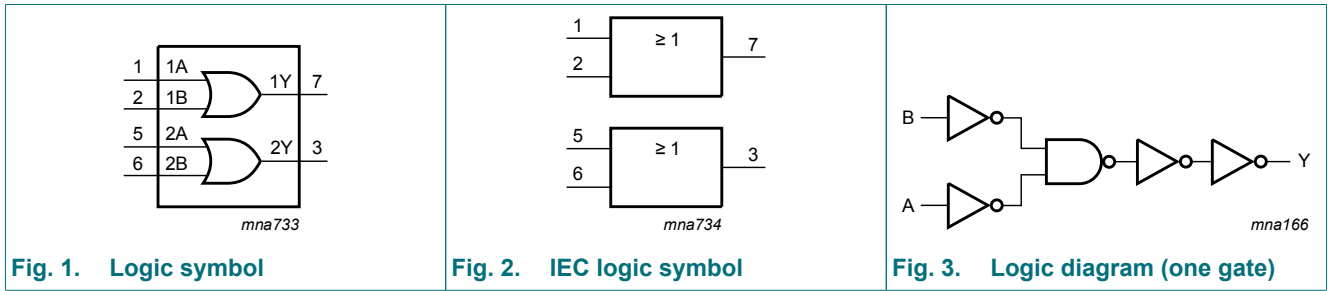
## 4. Marking

Table 2. Marking

| Type number  | Marking code <sup>[1]</sup> |
|--------------|-----------------------------|
| 74AHC2G32DP  | A32                         |
| 74AHCT2G32DP | C32                         |
| 74AHC2G32DC  | A32                         |
| 74AHCT2G32DC | C32                         |

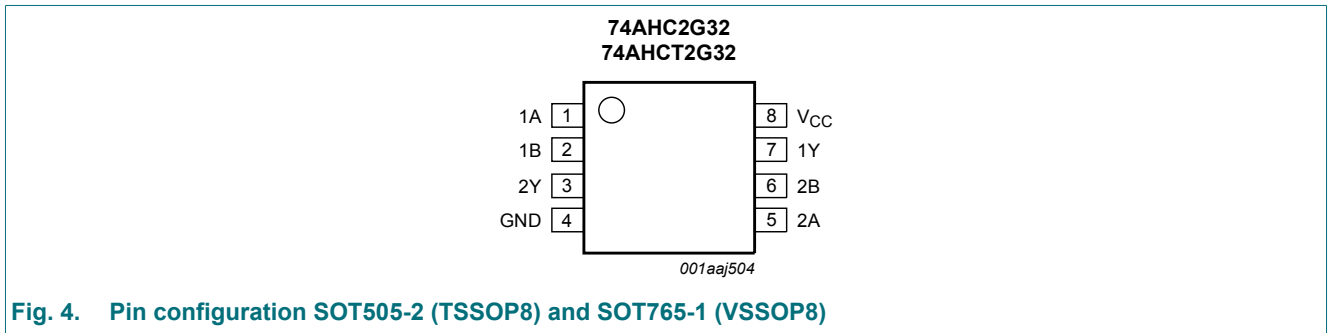
[1] The pin 1 indicator is located on the lower left corner of the device, below the marking code.

### 5. Functional diagram



### 6. Pinning information

#### 6.1. Pinning



#### 6.2. Pin description

Table 3. Pin description

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

### 7. Functional description

Table 4. Function table

H = HIGH voltage level; L = LOW voltage level.

| Input |    | Output |
|-------|----|--------|
| nA    | nB | nY     |
| 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).

| Symbol    | Parameter               | Conditions                                   | Min  | Max      | Unit |
|-----------|-------------------------|--|------|----------|------|
| $V_{CC}$  | supply voltage          |  | -0.5 | +7.0     | V    |
| $V_I$     | input voltage           |  | -0.5 | +7.0     | V    |
| $I_{IK}$  | input clamping current  | $V_I < -0.5$ V [1]                           | -20  | -        | mA   |
| $I_{OK}$  | output clamping current | $V_O < -0.5$ V or $V_O > V_{CC} + 0.5$ V [1] | -    | $\pm 20$ | mA   |
| $I_O$     | output current          | $-0.5$ V $< V_O < V_{CC} + 0.5$ V            | -    | $\pm 25$ | mA   |
| $I_{CC}$  | supply current          |  | -    | 75       | mA   |
| $I_{GND}$ | ground current          |  | -75  | -        | mA   |
| $T_{stg}$ | storage temperature     |  | -65  | +150     | °C   |
| $P_{tot}$ | total power dissipation | $T_{amb} = -40$ °C to +125 °C [2]            | -    | 250      | 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  $P_{tot}$  derates linearly with 2.5 mW/K.

For VSSOP8 package: above 110 °C the value of  $P_{tot}$  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                   | 74AHC2G32 |     |          | 74AHCT2G32 |     |          | Unit |
|---------------------|-------------------------------------|------------------------------|-----------|-----|----------|------------|-----|----------|------|
|                     |                                     |                              | Min       | Typ | Max      | Min        | Typ | Max      |      |
| $V_{CC}$            | supply voltage                      |                              | 2.0       | 5.0 | 5.5      | 4.5        | 5.0 | 5.5      | V    |
| $V_I$               | input voltage                       |                              | 0         | -   | 5.5      | 0          | -   | 5.5      | V    |
| $V_O$               | output voltage                      |                              | 0         | -   | $V_{CC}$ | 0          | -   | $V_{CC}$ | V    |
| $T_{amb}$           | ambient temperature                 |                              | -40       | +25 | +125     | -40        | +25 | +125     | °C   |
| $\Delta t/\Delta V$ | input transition rise and fall rate | $V_{CC} = 3.3$ V $\pm 0.3$ V | -         | -   | 100      | -          | -   | -        | ns/V |
|                     |                                     | $V_{CC} = 5.0$ V $\pm 0.5$ V | -         | -   | 20       | -          | -   | 20       | ns/V |

## 10. Static characteristics

**Table 7. Static characteristics**

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

| Symbol           | Parameter                | Conditions       | 25 °C |     |      | -40 °C to +85 °C |      | -40 °C to +125 °C |      | Unit |
|------------------|--------------------------|------------------|-------|-----|------|------------------|------|-------------------|------|------|
|                  |                          |                  | Min   | Typ | Max  | Min              | Max  | Min               | Max  |      |
| <b>74AHC2G32</b> |                          |                  |       |     |      |                  |      |                   |      |      |
| $V_{IH}$         | HIGH-level input voltage | $V_{CC} = 2.0$ V | 1.5   | -   | -    | 1.5              | -    | 1.5               | -    | V    |
|                  |                          | $V_{CC} = 3.0$ V | 2.1   | -   | -    | 2.1              | -    | 2.1               | -    | V    |
|                  |                          | $V_{CC} = 5.5$ V | 3.85  | -   | -    | 3.85             | -    | 3.85              | -    | V    |
| $V_{IL}$         | LOW-level input voltage  | $V_{CC} = 2.0$ V | -     | -   | 0.5  | -                | 0.5  | -                 | 0.5  | V    |
|                  |                          | $V_{CC} = 3.0$ V | -     | -   | 0.9  | -                | 0.9  | -                 | 0.9  | V    |
|                  |                          | $V_{CC} = 5.5$ V | -     | -   | 1.65 | -                | 1.65 | -                 | 1.65 | V    |

| Symbol            | Parameter                 | Conditions   | 25 °C |     |      | -40 °C to +85 °C |      | -40 °C to +125 °C |      | Unit |
|-------------------|---------------------------|--|-------|-----|------|------------------|------|-------------------|------|------|
|                   |                           |  | Min   | Typ | Max  | Min              | Max  | Min               | Max  |      |
| V <sub>OH</sub>   | HIGH-level output voltage | V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>  |       |     |      |                  |      |                   |      |      |
|                   |                           | I <sub>O</sub> = -50 µA; V <sub>CC</sub> = 2.0 V   | 1.9   | 2.0 | -    | 1.9              | -    | 1.9               | -    | V    |
|                   |                           | I <sub>O</sub> = -50 µA; V <sub>CC</sub> = 3.0 V   | 2.9   | 3.0 | -    | 2.9              | -    | 2.9               | -    | V    |
|                   |                           | I <sub>O</sub> = -50 µA; V <sub>CC</sub> = 4.5 V   | 4.4   | 4.5 | -    | 4.4              | -    | 4.4               | -    | V    |
|                   |                           | I <sub>O</sub> = -4.0 mA; V <sub>CC</sub> = 3.0 V  | 2.58  | -   | -    | 2.48             | -    | 2.40              | -    | V    |
|                   |                           | I <sub>O</sub> = -8.0 mA; V <sub>CC</sub> = 4.5 V  | 3.94  | -   | -    | 3.8              | -    | 3.70              | -    | 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> = 50 µA; V <sub>CC</sub> = 2.0 V  | -     | 0   | 0.1  | -                | 0.1  | -                 | 0.1  | V    |
|                   |                           | I <sub>O</sub> = 50 µA; V <sub>CC</sub> = 3.0 V  | -     | 0   | 0.1  | -                | 0.1  | -                 | 0.1  | V    |
|                   |                           | I <sub>O</sub> = 50 µA; V <sub>CC</sub> = 4.5 V  | -     | 0   | 0.1  | -                | 0.1  | -                 | 0.1  | V    |
|                   |                           | I <sub>O</sub> = 4.0 mA; V <sub>CC</sub> = 3.0 V   | -     | -   | 0.36 | -                | 0.44 | -                 | 0.55 | V    |
|                   |                           | I <sub>O</sub> = 8.0 mA; V <sub>CC</sub> = 4.5 V   | -     | -   | 0.36 | -                | 0.44 | -                 | 0.55 | V    |
| I <sub>I</sub>    | input leakage current     | V <sub>I</sub> = 5.5 V or GND;<br>V <sub>CC</sub> = 0 V to 5.5 V   | -     | -   | 0.1  | -                | 1.0  | -                 | 2.0  | µA   |
| I <sub>CC</sub>   | supply current            | V <sub>I</sub> = V <sub>CC</sub> or GND; I <sub>O</sub> = 0 A;<br>V <sub>CC</sub> = 5.5 V  | -     | -   | 1.0  | -                | 10   | -                 | 40   | µA   |
| C <sub>I</sub>    | input capacitance         |  | -     | 1.5 | 10   | -                | 10   | -                 | 10   | pF   |
| <b>74AHCT2G32</b> |                           |  |       |     |      |                  |      |                   |      |      |
| V <sub>IH</sub>   | HIGH-level input voltage  | V <sub>CC</sub> = 4.5 V to 5.5 V   | 2.0   | -   | -    | 2.0              | -    | 2.0               | -    | V    |
| V <sub>IL</sub>   | LOW-level input voltage   | V <sub>CC</sub> = 4.5 V to 5.5 V   | -     | -   | 0.8  | -                | 0.8  | -                 | 0.8  | V    |
| V <sub>OH</sub>   | HIGH-level output voltage | V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; V <sub>CC</sub> = 4.5 V  |       |     |      |                  |      |                   |      |      |
|                   |                           | I <sub>O</sub> = -50 µA  | 4.4   | 4.5 | -    | 4.4              | -    | 4.4               | -    | V    |
|                   |                           | I <sub>O</sub> = -8.0 mA   | 3.94  | -   | -    | 3.8              | -    | 3.70              | -    | V    |
| V <sub>OL</sub>   | LOW-level output voltage  | V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; V <sub>CC</sub> = 4.5 V  |       |     |      |                  |      |                   |      |      |
|                   |                           | I <sub>O</sub> = 50 µA   | -     | 0   | 0.1  | -                | 0.1  | -                 | 0.1  | V    |
|                   |                           | I <sub>O</sub> = 8.0 mA  | -     | -   | 0.36 | -                | 0.44 | -                 | 0.55 | V    |
| I <sub>I</sub>    | input leakage current     | V <sub>I</sub> = 5.5 V or GND;<br>V <sub>CC</sub> = 0 V to 5.5 V   | -     | -   | 0.1  | -                | 1.0  | -                 | 2.0  | µA   |
| I <sub>CC</sub>   | supply current            | V <sub>I</sub> = V <sub>CC</sub> or GND; I <sub>O</sub> = 0 A;<br>V <sub>CC</sub> = 5.5 V  | -     | -   | 1.0  | -                | 10   | -                 | 40   | µA   |
| ΔI <sub>CC</sub>  | additional supply current | per input pin; V <sub>I</sub> = 3.4 V;<br>other inputs at V <sub>CC</sub> or GND;<br>I <sub>O</sub> = 0 A; V <sub>CC</sub> = 5.5 V | -     | -   | 1.35 | -                | 1.5  | -                 | 1.5  | mA   |
| C <sub>I</sub>    | input capacitance         |  | -     | 1.5 | 10   | -                | 10   | -                 | 10   | pF   |

## 11. Dynamic characteristics

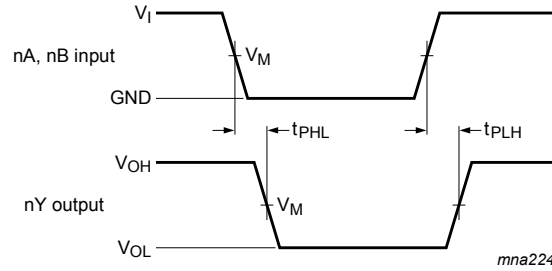
**Table 8. Dynamic characteristics**

$GND = 0\text{ V}$ ; for test circuit see Fig. 6.

| Symbol            | Parameter                     | Conditions   | 25 °C |     |      | -40 °C to +85 °C |      | -40 °C to +125 °C |      | Unit |
|-------------------|-------------------------------|--|-------|-----|------|------------------|------|-------------------|------|------|
|                   |                               |  | Min   | Typ | Max  | Min              | Max  | Min               | Max  |      |
| <b>74AHC2G32</b>  |                               |  |       |     |      |                  |      |                   |      |      |
| $t_{pd}$          | propagation delay             | nA, nB to nY; see Fig. 5 [1]   |       |     |      |                  |      |                   |      |      |
|                   |                               | $V_{CC} = 3.0\text{ V to }3.6\text{ V}$ [2]  |       |     |      |                  |      |                   |      |      |
|                   |                               | $C_L = 15\text{ pF}$   | -     | 4.4 | 7.9  | 1.0              | 9.5  | 1.0               | 10.0 | ns   |
|                   |                               | $C_L = 50\text{ pF}$   | -     | 6.3 | 11.4 | 1.0              | 13.0 | 1.0               | 14.5 | ns   |
|                   |                               | $V_{CC} = 4.5\text{ V to }5.5\text{ V}$ [3]  |       |     |      |                  |      |                   |      |      |
|                   |                               | $C_L = 15\text{ pF}$   | -     | 3.2 | 5.5  | 1.0              | 6.5  | 1.0               | 7.0  | ns   |
|                   |                               | $C_L = 50\text{ pF}$   | -     | 4.6 | 7.5  | 1.0              | 8.5  | 1.0               | 9.5  | ns   |
| $C_{PD}$          | power dissipation capacitance | per buffer; $C_L = 50\text{ pF}$ ; $f_i = 1\text{ MHz}$ ; $V_i = GND\text{ to }V_{CC}$ [4] | -     | 16  | -    | -                | -    | -                 | -    | pF   |
| <b>74AHCT2G32</b> |                               |  |       |     |      |                  |      |                   |      |      |
| $t_{pd}$          | propagation delay             | nA, nB to nY; see Fig. 5 [1]   |       |     |      |                  |      |                   |      |      |
|                   |                               | $V_{CC} = 4.5\text{ V to }5.5\text{ V}$ [3]  |       |     |      |                  |      |                   |      |      |
|                   |                               | $C_L = 15\text{ pF}$   | -     | 3.3 | 6.9  | 1.0              | 8.0  | 1.0               | 9.0  | ns   |
|                   |                               | $C_L = 50\text{ pF}$   | -     | 4.8 | 7.9  | 1.0              | 9.0  | 1.0               | 10.0 | ns   |
| $C_{PD}$          | power dissipation capacitance | per buffer; $C_L = 50\text{ pF}$ ; $f_i = 1\text{ MHz}$ ; $V_i = GND\text{ to }V_{CC}$ [4] | -     | 17  | -    | -                | -    | -                 | -    | pF   |

- [1]  $t_{pd}$  is the same as  $t_{PLH}$  and  $t_{PHL}$ .
- [2] Typical values are measured at  $V_{CC} = 3.3\text{ V}$ .
- [3] Typical values are measured at  $V_{CC} = 5.0\text{ V}$ .
- [4]  $C_{PD}$  is used to determine the dynamic power dissipation ( $P_D$  in  $\mu\text{W}$ ).  
 $P_D = C_{PD} \times V_{CC}^2 \times f_i \times N + \Sigma(C_L \times V_{CC}^2 \times f_o)$  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 the outputs.

11.1. Waveforms and test circuit



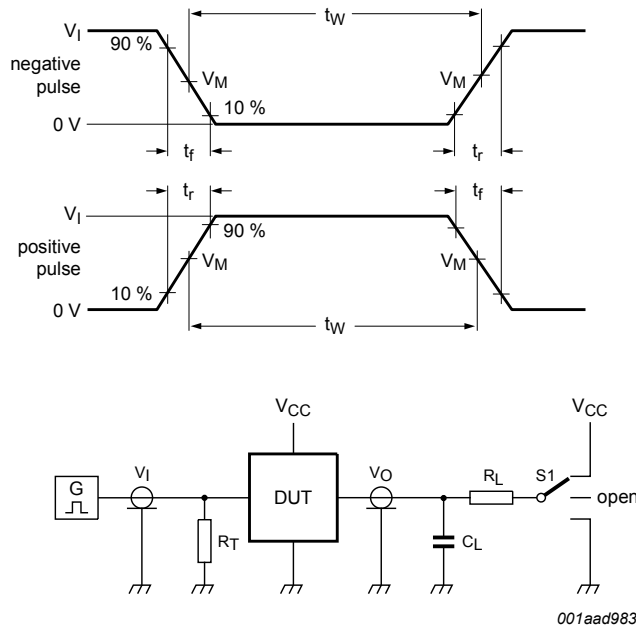
Measurement points are given in [Table 9](#).

$V_{OL}$  and  $V_{OH}$  are typical output voltage levels that occur with the output load.

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

Table 9. Measurement points

| Type       | Input       | Output      |
|------------|-------------|-------------|
|            | $V_M$       | $V_M$       |
| 74AHC2G32  | $0.5V_{CC}$ | $0.5V_{CC}$ |
| 74AHCT2G32 | 1.5 V       | $0.5V_{CC}$ |



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

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.

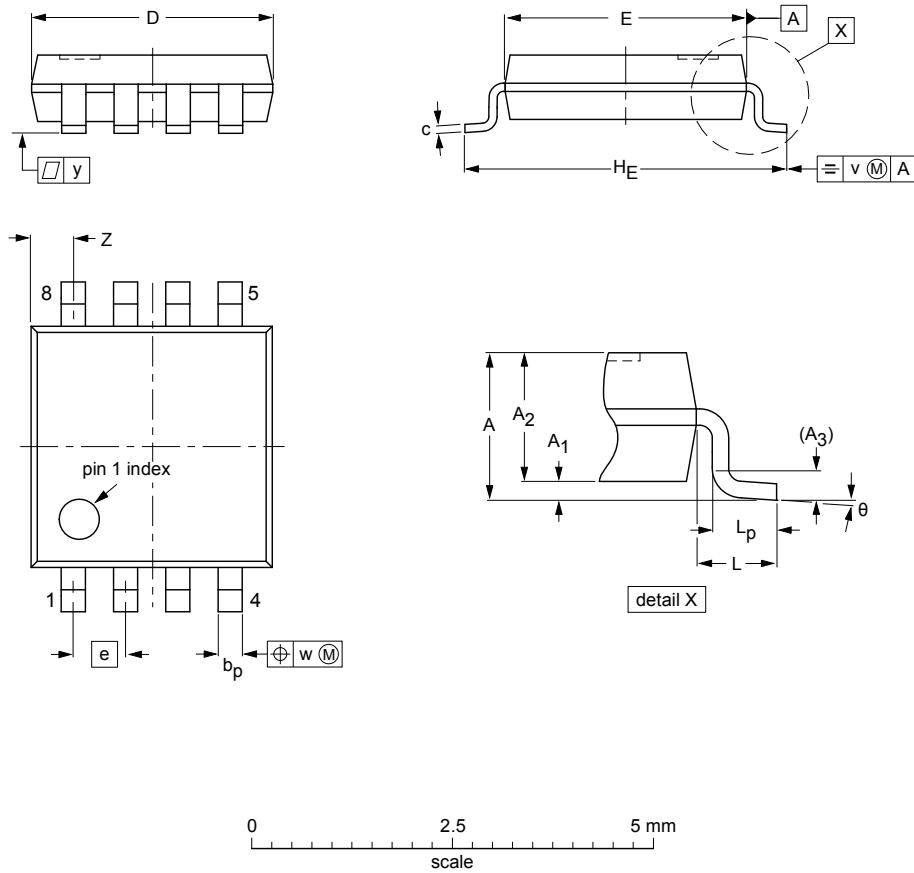
Fig. 6. Test circuit for measuring switching times

Table 10. Test data

| Type       | Input    |             | Load         |              | S1 position        |                    |                    |
|------------|----------|-------------|--------------|--------------|--------------------|--------------------|--------------------|
|            | $V_I$    | $t_r, t_f$  | $C_L$        | $R_L$        | $t_{PHL}, t_{PLH}$ | $t_{PZH}, t_{PHZ}$ | $t_{PZL}, t_{PLZ}$ |
| 74AHC2G32  | $V_{CC}$ | $\leq 3$ ns | 15 pF, 50 pF | 1 k $\Omega$ | open               | GND                | $V_{CC}$           |
| 74AHCT2G32 | 3 V      | $\leq 3$ ns | 15 pF, 50 pF | 1 k $\Omega$ | open               | GND                | $V_{CC}$           |

12. Package outline

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



DIMENSIONS (mm are the original dimensions)

| UNIT | A max. | A <sub>1</sub> | A <sub>2</sub> | A <sub>3</sub> | b <sub>p</sub> | c            | D <sup>(1)</sup> | E <sup>(1)</sup> | e    | H <sub>E</sub> | L   | L <sub>p</sub> | v   | w    | y   | Z <sup>(1)</sup> | θ        |
|------|--------|----------------|----------------|----------------|----------------|--------------|------------------|------------------|------|----------------|-----|----------------|-----|------|-----|------------------|----------|
| mm   | 1.1    | 0.15<br>0.00   | 0.95<br>0.75   | 0.25           | 0.38<br>0.22   | 0.18<br>0.08 | 3.1<br>2.9       | 3.1<br>2.9       | 0.65 | 4.1<br>3.9     | 0.5 | 0.47<br>0.33   | 0.2 | 0.13 | 0.1 | 0.70<br>0.35     | 8°<br>0° |

Note

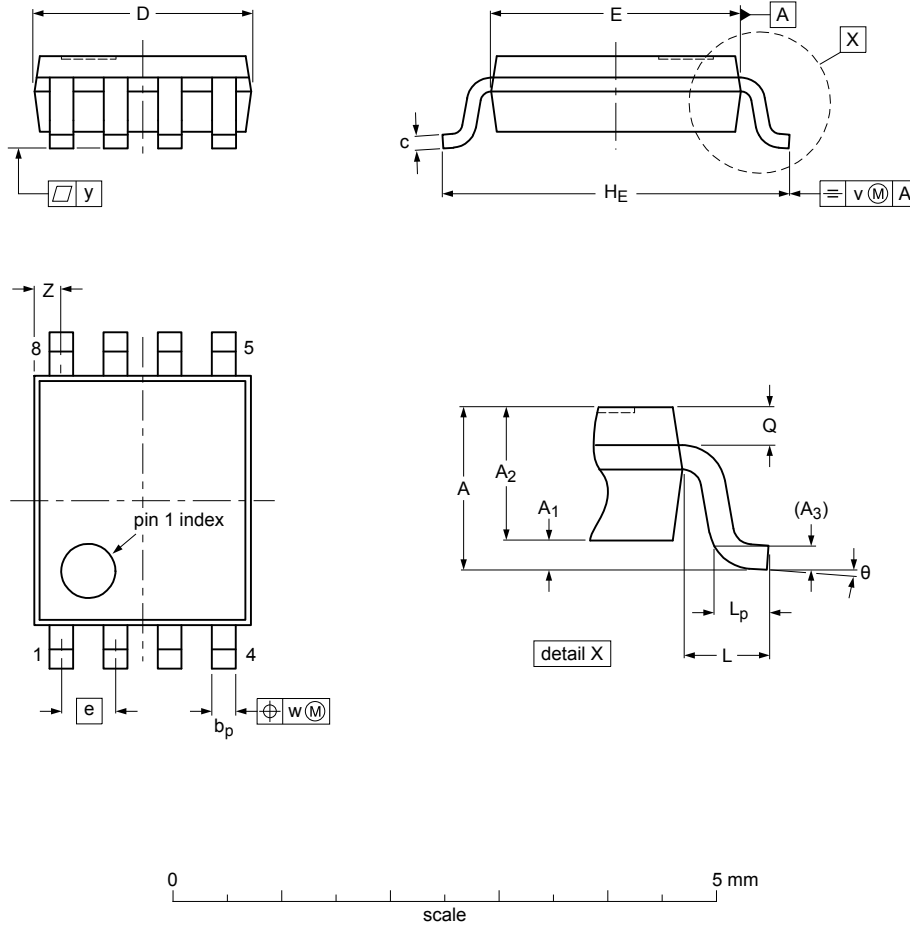
1. Plastic or metal protrusions of 0.15 mm maximum per side are not included.

| OUTLINE VERSION | REFERENCES |       |       |  | EUROPEAN PROJECTION | ISSUE DATE |
|-----------------|------------|-------|-------|--|---------------------|------------|
|                 | IEC        | JEDEC | JEITA |  |                     |            |
| SOT505-2        |            | ---   |       |  |                     | 02-01-16   |

Fig. 7. Package outline SOT505-2 (TSSOP8)

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

SOT765-1



Dimensions (mm are the original dimensions)

| Unit | A <sup>A</sup><br>max. | A <sub>1</sub> | A <sub>2</sub> | A <sub>3</sub> | b <sub>p</sub> | c    | D <sup>(1)</sup> | E <sup>(2)</sup> | e | H <sub>E</sub> | L | L <sub>p</sub> | Q    | v   | w    | y   | Z <sup>(1)</sup> | θ  |
|------|------------------------|----------------|----------------|----------------|----------------|------|------------------|------------------|---|----------------|---|----------------|------|-----|------|-----|------------------|----|
| max  |                        | 0.15           | 0.85           |                | 0.27           | 0.23 | 2.1              | 2.4              |   | 3.2            |   | 0.40           | 0.21 |     |      |     | 0.4              | 8° |
| mm   | nom                    | 1              |                | 0.12           |                |      |                  | 0.5              |   | 0.4            |   |                |      | 0.2 | 0.08 | 0.1 |                  |    |
|      | min                    |                | 0.00           | 0.60           | 0.17           | 0.08 | 1.9              | 2.2              |   | 3.0            |   | 0.15           | 0.19 |     |      |     | 0.1              | 0° |

Note

1. Plastic or metal protrusions of 0.15 mm maximum per side are not included.
2. Plastic or metal protrusions of 0.25 mm maximum per side are not included.

sot765-1\_po

| Outline version | References |        |       | European projection | Issue date         |
|-----------------|------------|--------|-------|---------------------|--------------------|
|                 | IEC        | JEDEC  | JEITA |                     |                    |
| SOT765-1        |            | MO-187 |       |                     | -07-06-02-16-05-31 |

Fig. 8. Package outline SOT765-1 (VSSOP8)



## 13. Abbreviations

Table 11. Abbreviations

| Acronym | Description                             |
|---------|---|
| CDM     | Charged Device Model                    |
| 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 12. Revision history

| Document ID        | Release date  | Data sheet status     | Change notice | Supersedes         |
|--------------------|---|-----------------------|---------------|--------------------|
| 74AHC_AHCT2G32 v.4 | 20181218  | Product data sheet    | -             | 74AHC_AHCT2G32 v.3 |
| Modifications:     | <ul style="list-style-type: none"> <li>The format of this data sheet has been redesigned to comply with the identity guidelines of Nexperia.</li> <li>Legal texts have been adapted to the new company name where appropriate.</li> <li>Type numbers 74AHC2G32GD and 74AHCT2G32GD removed.</li> </ul>                             |                       |               |                    |
| 74AHC_AHCT2G32 v.3 | 20130514  | Product data sheet    | -             | 74AHC_AHCT2G32 v.2 |
| Modifications:     | <ul style="list-style-type: none"> <li>For type number 74AHC2G32GD and 74AHCT2G32GD XSON8U has changed to XSON8.</li> </ul>   |                       |               |                    |
| 74AHC_AHCT2G32 v.2 | 20090120  | Product data sheet    | -             | 74AHC_AHCT2G32 v.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>Added type number 74AHC2G32GD and 74AHCT2G32GD (XSON8U package).</li> </ul> |                       |               |                    |
| 74AHC_AHCT2G32 v.1 | 20040223  | Product specification | -             | -                  |

## 15. Legal information

### 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".
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