

74AHCT07A

Hex buffer with open-drain outputs

Rev. 1 — 19 December 2016

Product data sheet

1. General description

The 74AHCT07A is a hex buffer with open-drain outputs. The outputs are open-drain and can be connected to other open-drain outputs to implement active-LOW wired-OR or active-HIGH wired-AND functions.

Designed to operate over a V_{CC} range from 4.5 V to 5.5 V, the inputs are TTL compatible, which allows the device to be used to translate from 3.3 V to 5 V.

Schmitt-trigger action at all inputs makes the circuit tolerant of slower input rise and fall times.

This device is fully specified for partial Power-down applications using I_{OFF} . The I_{OFF} circuitry disables the output, preventing the damaging backflow current through the device when it is powered down.

2. Features and benefits

- Direct interface with TTL levels
- Supply voltage range from 4.5 V to 5.5 V
- Typical t_{PZL} of 3.4 ns at 5 V
- Typical $V_{OL(p)} < 0.8$ V at $V_{CC} = 5$ V, $T_{amb} = 25$ °C
- Supports mixed-mode voltage operation on all ports
- I_{OFF} circuitry provides partial Power-down mode operation
- Latch-up performance exceeds 250 mA per JESD 78 Class II
- ESD protection:
 - ◆ HBM ANSI/ESDA/JEDEC JS-001 Class 2 exceeds 3 kV
 - ◆ MM JESD22-A115-A exceeds 150 V
 - ◆ CDM JESD22-C101E exceeds 2 kV
- 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 |
| 74AHCT07APW | −40 °C to +125 °C | TSSOP14 | plastic thin shrink small outline package; 14 leads; body width 4.4 mm | SOT402-1 |

4. Functional diagram

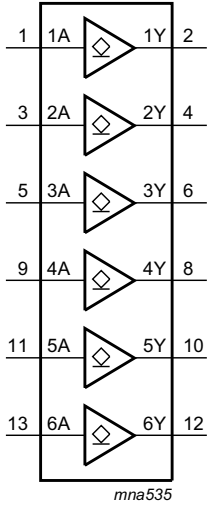


Fig 1. Logic symbol

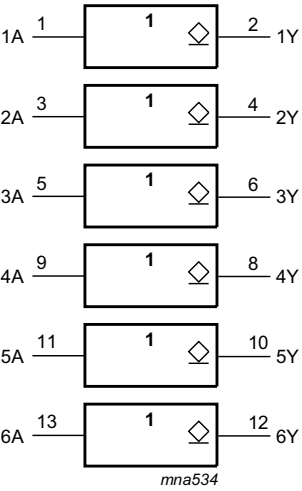


Fig 2. IEC logic symbol

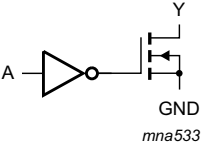


Fig 3. Logic diagram for one gate

5. Pinning information

5.1 Pinning

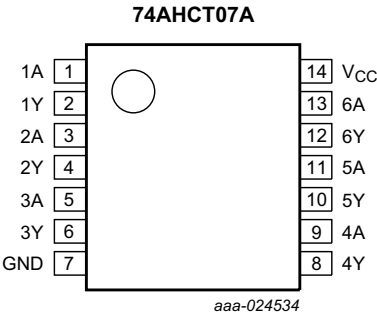


Fig 4. Pin configuration TSSOP14

5.2 Pin description

Table 2. Pin description

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

6. Functional description

Table 3. Function selection [1]

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

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

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 |
| V _I | input voltage | [1] | −0.5 | +7.0 | V |
| V _O | output voltage | output LOW state, power-down or 3-state mode [2] | −0.5 | +7.0 | V |
| I _{IK} | input clamping current | V _I < 0 V | −20 | - | mA |
| I _{OK} | output clamping current | V _O < 0 V | −20 | - | mA |
| I _O | output current | V _O = 0 V to V _{CC} | - | ±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 [3] | - | 500 | mW |

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

[2] The output voltage ratings may be exceeded if the output current ratings are observed.

[3] For TSSOP14 packages: above 75 °C the value of P_{tot} derates linearly at 7 mW/K.

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 | | 4.5 | 5.0 | 5.5 | V |
| V_I | input voltage | | 0 | - | 5.5 | V |
| V_O | output voltage | output LOW state, power-down or 3-state mode | 0 | - | 5.5 | V |
| T_{amb} | ambient temperature | | -40 | +25 | +125 | °C |
| $\Delta t/\Delta V$ | input transition rise and fall rate | $V_{CC} = 5.0\text{ V} \pm 0.5\text{ V}$ | - | - | 20 | ns/V |

9. Static characteristics

Table 6. 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 | |
| V_{IH} | HIGH-level input voltage | $V_{CC} = 4.5\text{ V to }5.5\text{ V}$ | 2 | - | - | 2 | - | 2 | - | V |
| V_{IL} | LOW-level input voltage | $V_{CC} = 4.5\text{ V to }5.5\text{ V}$ | - | - | 0.8 | - | 0.8 | - | 0.8 | V |
| V_{OL} | LOW-level output voltage | $V_I = V_{IH}\text{ or }V_{IL}; V_{CC} = 4.5\text{ V}$ | | | | | | | | |
| | | $I_O = 50\text{ }\mu\text{A}$ | - | 0 | 0.1 | - | 0.1 | - | 0.1 | V |
| | | $I_O = 8\text{ mA}$ | - | - | 0.36 | - | 0.44 | - | 0.55 | V |
| I_{OZ} | OFF-state output current | $V_{CC} = 5.5\text{ V}; V_I = V_{IH}\text{ or }V_{IL}; V_O = \text{GND to }5.5\text{ V}$ | - | - | ± 0.25 | - | ± 2.5 | - | ± 2.5 | μA |
| I_{OFF} | power-off leakage current | $V_I\text{ or }V_O = \text{GND to }5.5\text{ V}; V_{CC} = 0\text{ V}$ | - | - | 0.5 | - | 5 | - | 5 | μA |
| I_I | input leakage current | $V_I = V_{CC}\text{ or GND}; V_{CC} = 0\text{ V to }5.5\text{ V}$ | - | - | ± 0.1 | - | ± 1 | - | ± 1 | μA |
| I_{CC} | supply current | $V_I = V_{CC}\text{ or GND}; I_O = 0\text{ A}; V_{CC} = 5.5\text{ V}$ | - | - | 2 | - | 20 | - | 20 | μA |
| ΔI_{CC} | additional supply current | per input pin; $V_I = 3.4\text{ V}; I_O = 0\text{ A};$ other pins at $V_{CC}\text{ or GND}; V_{CC} = 5.5\text{ V}$ | - | - | 1.35 | - | 1.5 | - | 1.5 | mA |

10. Dynamic characteristics

Table 7. Dynamic characteristics
GND = 0 V. For test circuit see Figure 6.

| Symbol | Parameter | Conditions | 25 °C | | | –40 °C to +85 °C | | –40 °C to +125 °C | | Unit |
|------------------|------------------------------------|---|-------|--------------------|-----|------------------|-----|-------------------|------|------|
| | | | Min | Typ ^[1] | Max | Min | Max | Min | Max | |
| t _{PZL} | OFF-state to LOW propagation delay | nA to nY; see Figure 5 | | | | | | | | |
| | | V _{CC} = 4.5 V to 5.5 V | | | | | | | | |
| | | C _L = 15 pF | - | 3.4 | 5.3 | 1 | 6.5 | 1 | 7.6 | ns |
| | | C _L = 50 pF | - | 5 | 7.8 | 1 | 9.7 | 1 | 11.4 | ns |
| t _{PLZ} | LOW to OFF-state propagation delay | nA to nY; see Figure 5 | | | | | | | | |
| | | V _{CC} = 4.5 V to 5.5 V | | | | | | | | |
| | | C _L = 15 pF | - | 2.9 | 4 | 1 | 4.6 | 1 | 5.2 | ns |
| | | C _L = 50 pF | - | 5.2 | 6.7 | 1 | 7.6 | 1 | 8.5 | ns |
| C _I | input capacitance | V _I = V _{CC} or GND; V _{CC} = 5 V | - | 2 | 6 | - | 6 | - | 6 | pF |
| C _O | output capacitance | V _O = V _{CC} or GND; V _{CC} = 5 V | - | 5 | - | - | - | - | - | pF |
| C _{PD} | power dissipation capacitance | per buffer; ^[2] C _L = 0 pF; f = 10 MHz; V _I = GND to V _{CC} | - | 2 | - | - | - | - | - | pF |

[1] Typical values are measured at T_{amb} = 25 °C and V_{CC} = 5 V.

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

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

Table 8. Noise characteristics
GND = 0 V. For test circuit see Figure 6.

| Symbol | Parameter | Conditions | T _{amb} = 25 °C | | | Unit |
|---|---------------------------------------|------------|--------------------------|------|-----|------|
| | | | Min | Typ | Max | |
| V _{CC} = 5 V; C _L = 50 pF | | | | | | |
| V _{OL(p)} | LOW-level output voltage (peak) | | - | 0.4 | 0.8 | V |
| V _{OL(v)} | LOW-level output voltage (valley) | | −0.8 | −0.2 | - | V |
| V _{IH(AC)} | AC HIGH-level input voltage (dynamic) | | 2 | - | - | V |
| V _{IL(AC)} | AC LOW-level input voltage (dynamic) | | - | - | 0.8 | V |

11. Waveforms

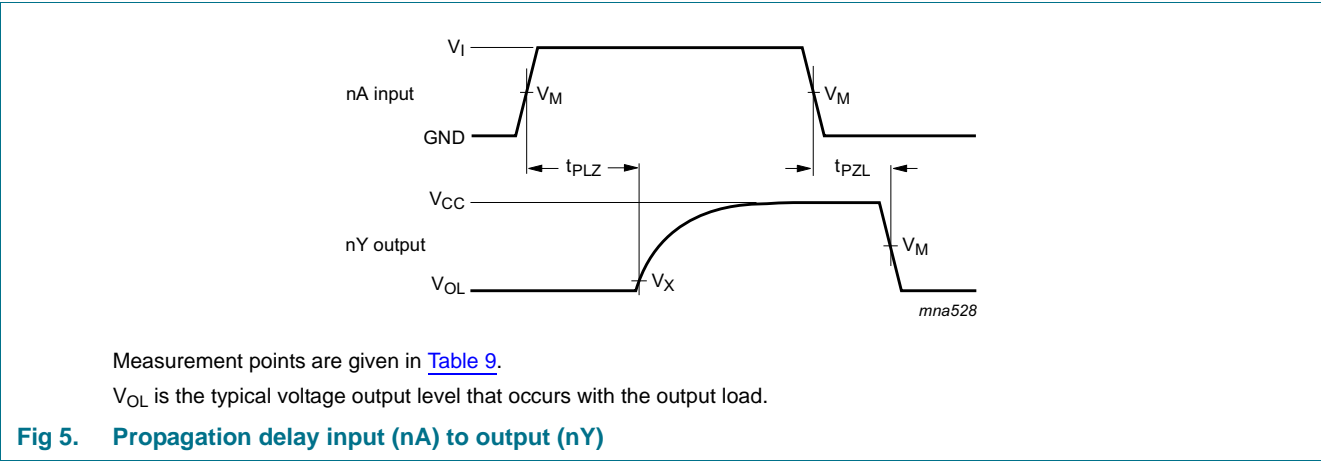


Table 9. Measurement points

| Input | Output | |
|----------------|-----------------------|-------------------------|
| V _M | V _M | V _X |
| 1.5 V | 0.5 × V _{CC} | V _{OL} + 0.3 V |

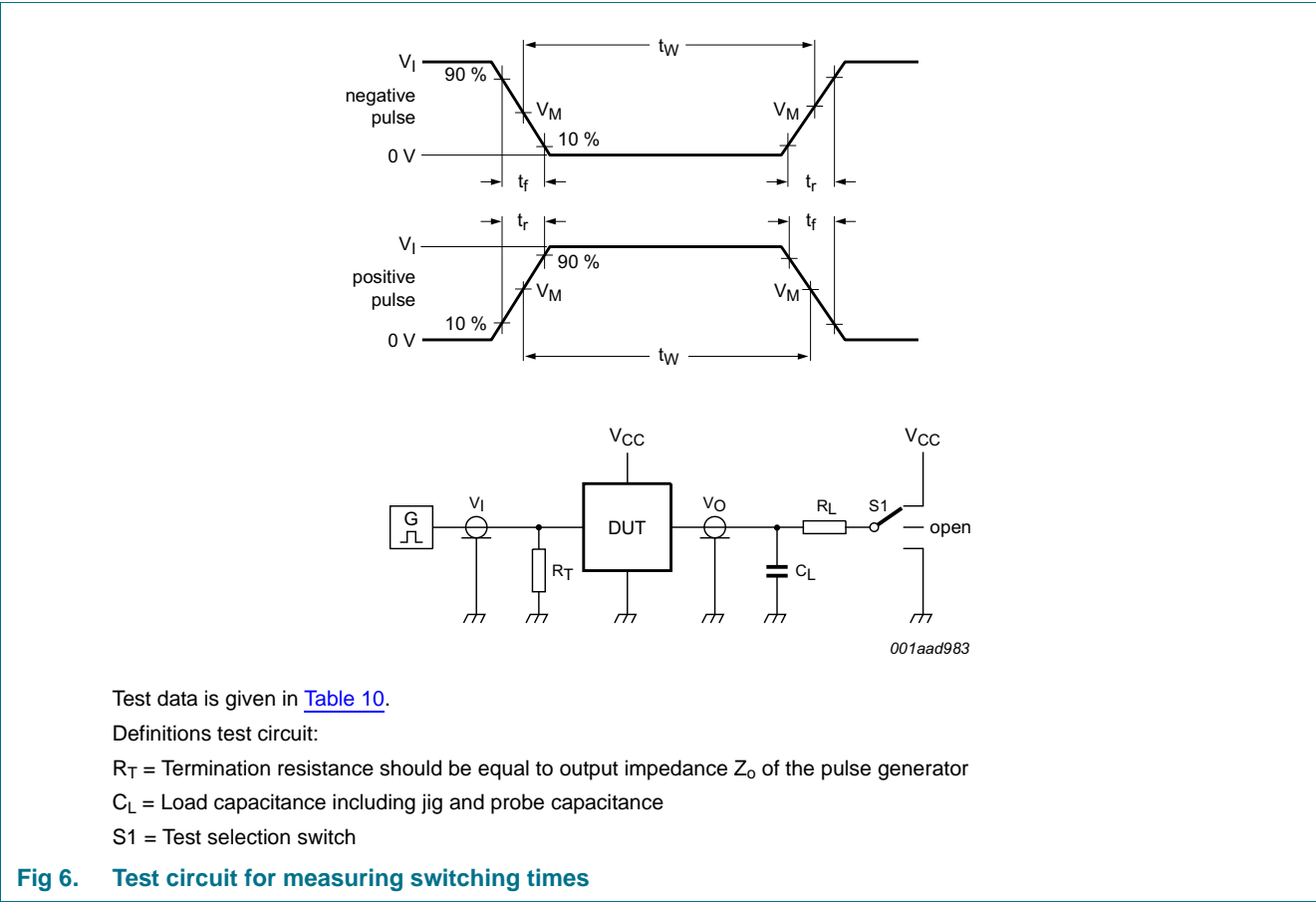


Table 10. Test data

| Input | | Load | S1 position |
|--------------|------------|--------------|--------------------|
| V_I | t_r, t_f | C_L | t_{PLZ}, t_{PZL} |
| GND to 3.0 V | 3.0 ns | 15 pF, 50 pF | V_{CC} |

12. Package outline

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

SOT402-1

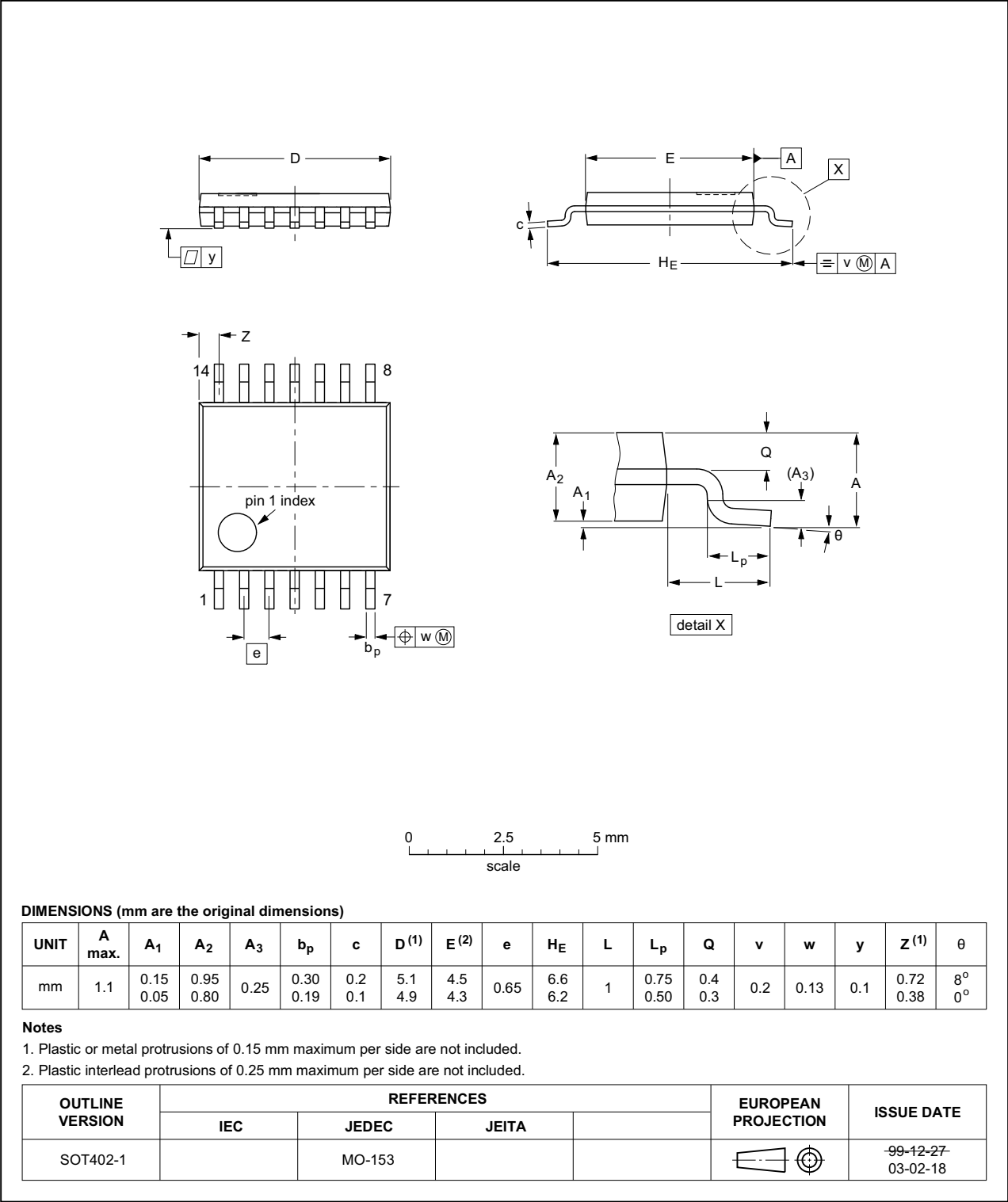


Fig 7. Package outline SOT402-1 (TSSOP14)

13. Abbreviations

Table 11. Abbreviations

| Acronym | Description |
|---------|-----------------------------|
| CDM | Charge Device Model |
| 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 |
|---------------|--------------|--------------------|---------------|------------|
| 74AHCT07A v.1 | 20161219 | Product data sheet | - | - |

15. Legal information

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