

74AHC244-Q100; 74AHCT244-Q100

Octal buffer/line driver; 3-state

Rev. 1 — 9 July 2012

Product data sheet

1. General description

The 74AHC244-Q100; 74AHCT244-Q100 is a high-speed Si-gate CMOS device.

The 74AHC244-Q100; 74AHCT244-Q100 has octal non-inverting buffer/line drivers with 3-state outputs. The 3-state outputs are controlled by the output enable inputs (\overline{nOE}). A HIGH on \overline{nOE} causes the outputs to assume a high-impedance OFF-state.

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 $+125\text{ }^{\circ}\text{C}$
- Balanced propagation delays
- All inputs have a Schmitt trigger action
- Inputs accept voltages higher than V_{CC}
- For 74AHC244-Q100 only: operates with CMOS input levels
- For 74AHCT244-Q100 only: operates with TTL input levels
- 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 | | | Version |
|-------------------------------------|-------------------|----------|--|----------|
| | Temperature range | Name | Description | |
| 74AHC244D-Q100 74AHCT244D-Q100 | -40 °C to +125 °C | SO20 | plastic small outline package; 20 leads; body width 7.5 mm | SOT163-1 |
| 74AHC244PW-Q100 74AHCT244PW-Q100 | -40 °C to +125 °C | TSSOP20 | plastic thin shrink small outline package; 20 leads; body width 4.4 mm | SOT360-1 |
| 74AHC244BQ-Q100 74AHCT244BQ-Q100 | -40 °C to +125 °C | DHVQFN20 | plastic dual-in-line compatible thermal enhanced very thin quad flat package; no leads; 20 terminals; body 2.5 × 4.5 × 0.85 mm | SOT764-1 |

4. Functional diagram

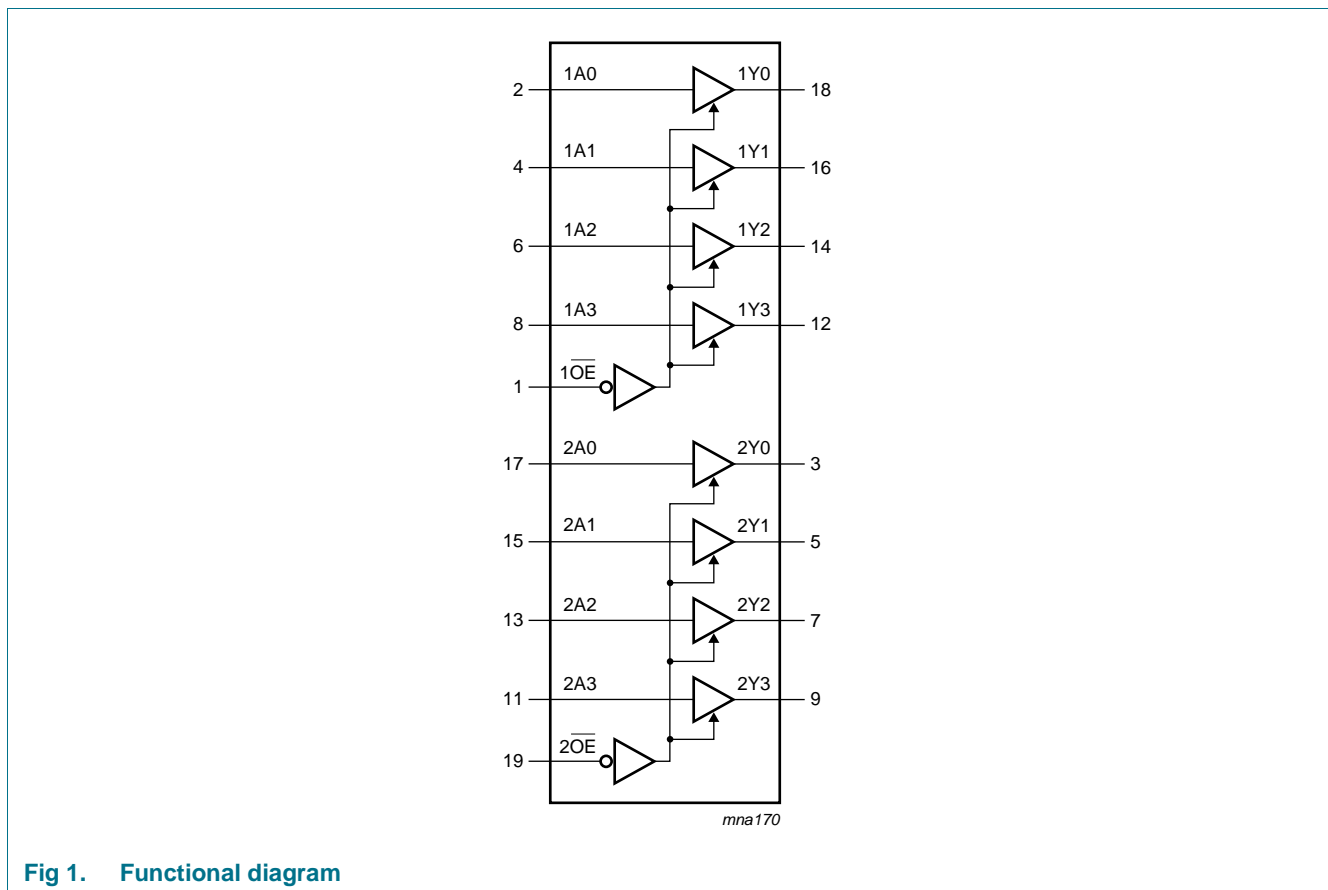


Fig 1. Functional diagram

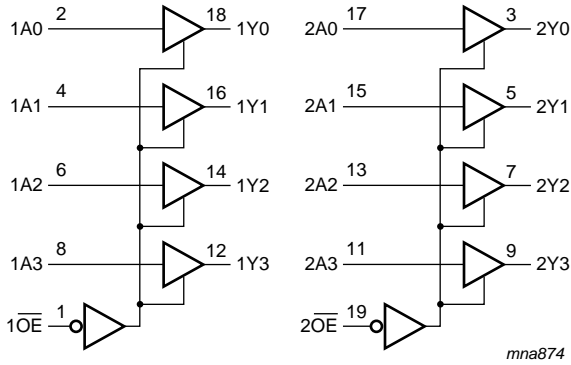


Fig 2. Logic symbol

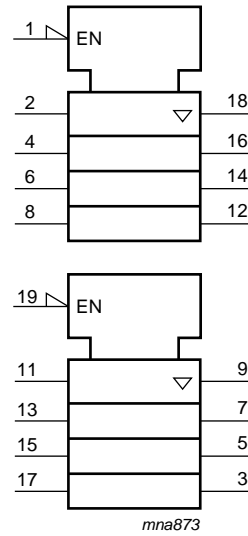


Fig 3. IEC logic symbol

5. Pinning information

5.1 Pinning

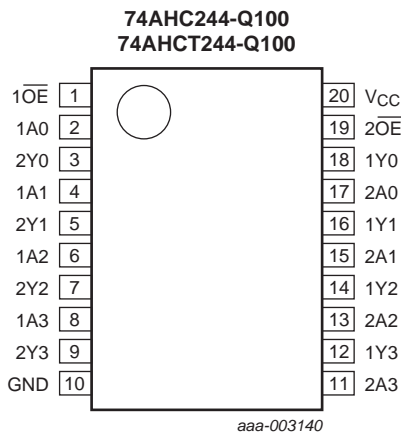
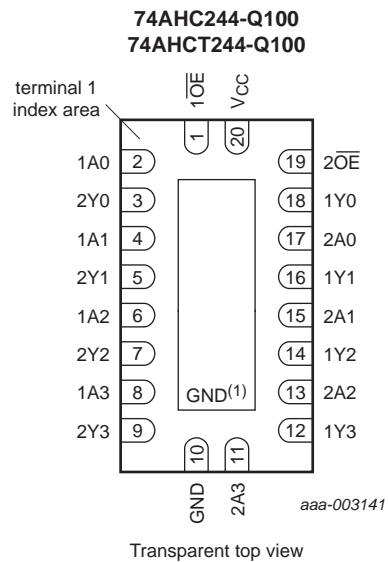


Fig 4. Pin configuration SO20, TSSOP20



- (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 5. Pin configuration DHVQFN20

5.2 Pin description

Table 2. Pin description

| Symbol | Pin | Description |
|----------------------------------|----------------|----------------------------------|
| $1\overline{OE}, 2\overline{OE}$ | 1, 19 | output enable input (active LOW) |
| 1A[0:3] | 2, 4, 6, 8 | data input |
| 2A[0:3] | 17, 15, 13, 11 | data input |
| 1Y[0:3] | 18, 16, 14, 12 | data output |
| 2Y[0:3] | 3, 5, 7, 9 | data output |
| GND | 10 | ground (0 V) |
| V _{CC} | 20 | supply voltage |

6. Functional description

Table 3. Function table^[1]

| Control | Input | Output |
|------------------|-------|--------|
| \overline{nOE} | nAn | nYn |
| L | L | L |
| | H | H |
| H | X | Z |

[1] H = HIGH voltage level; L = LOW voltage level; X = don't care; 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 | | -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] - | ±20 | mA |
| I _O | output current | V _O = -0.5 V to (V _{CC} + 0.5 V) | - | ±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 | | | |
| | SO20 package | | [2] - | 500 | mW |
| | TSSOP20 package | | [3] - | 500 | mW |
| | DHVQFN20 package | | [4] - | 500 | mW |

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

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

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

[4] 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 | 74AHC244-Q100 | | | 74AHCT244-Q100 | | | 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 |
| Δt/ΔV | input transition rise and fall rate | V _{CC} = 3.3 V ± 0.3 V | - | - | 100 | - | - | - | ns/V |
| | | V _{CC} = 5.0 V ± 0.5 V | - | - | 20 | - | - | 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 | |
| 74AHC244-Q100 | | | | | | | | | | |
| 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 |
| V _{OH} | HIGH-level output voltage | V _I = V _{IH} or V _{IL} | | | | | | | | |
| | | I _O = -50 μA; V _{CC} = 2.0 V | 1.9 | 2.0 | - | 1.9 | - | 1.9 | - | V |
| | | I _O = -50 μA; V _{CC} = 3.0 V | 2.9 | 3.0 | - | 2.9 | - | 2.9 | - | V |
| | | I _O = -50 μA; V _{CC} = 4.5 V | 4.4 | 4.5 | - | 4.4 | - | 4.4 | - | V |
| | | I _O = -4.0 mA; V _{CC} = 3.0 V | 2.58 | - | - | 2.48 | - | 2.40 | - | V |
| | | I _O = -8.0 mA; V _{CC} = 4.5 V | 3.94 | - | - | 3.8 | - | 3.70 | - | V |
| V _{OL} | LOW-level output voltage | V _I = V _{IH} or V _{IL} | | | | | | | | |
| | | I _O = 50 μA; V _{CC} = 2.0 V | - | 0 | 0.1 | - | 0.1 | - | 0.1 | V |
| | | I _O = 50 μA; V _{CC} = 3.0 V | - | 0 | 0.1 | - | 0.1 | - | 0.1 | V |
| | | I _O = 50 μA; V _{CC} = 4.5 V | - | 0 | 0.1 | - | 0.1 | - | 0.1 | V |
| | | I _O = 4.0 mA; V _{CC} = 3.0 V | - | - | 0.36 | - | 0.44 | - | 0.55 | V |
| | | I _O = 8.0 mA; V _{CC} = 4.5 V | - | - | 0.36 | - | 0.44 | - | 0.55 | V |
| I _{OZ} | OFF-state output current | V _I = V _{IH} or V _{IL} ; V _O = V _{CC} or GND; V _{CC} = 5.5 V | - | - | ±0.25 | - | ±2.5 | - | ±10.0 | μA |
| I _I | input leakage current | V _I = 5.5 V or GND; V _{CC} = 0 V to 5.5 V | - | - | 0.1 | - | 1.0 | - | 2.0 | μA |
| I _{CC} | supply current | V _I = V _{CC} or GND; I _O = 0 A; V _{CC} = 5.5 V | - | - | 4.0 | - | 40 | - | 80 | μA |

Table 6. Static characteristics ...continued
 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 | |
| C_I | input capacitance | | - | 3.0 | 10 | - | 10 | - | 10 | pF |
| C_O | output capacitance | | - | 4.0 | - | - | - | - | - | pF |
| 74AHCT244-Q100 | | | | | | | | | | |
| V_{IH} | HIGH-level input voltage | $V_{CC} = 4.5 \text{ V to } 5.5 \text{ V}$ | 2.0 | - | - | 2.0 | - | 2.0 | - | 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_{OH} | HIGH-level output voltage | $V_I = V_{IH} \text{ or } V_{IL}; V_{CC} = 4.5 \text{ V}$ | | | | | | | | |
| | | $I_O = -50 \mu\text{A}$ | 4.4 | 4.5 | - | 4.4 | - | 4.4 | - | V |
| | | $I_O = -8.0 \text{ mA}$ | 3.94 | - | - | 3.8 | - | 3.70 | - | V |
| V_{OL} | LOW-level output voltage | $V_I = V_{IH} \text{ or } V_{IL}; V_{CC} = 4.5 \text{ V}$ | | | | | | | | |
| | | $I_O = 50 \mu\text{A}$ | - | 0 | 0.1 | - | 0.1 | - | 0.1 | V |
| | | $I_O = 8.0 \text{ mA}$ | - | - | 0.36 | - | 0.44 | - | 0.55 | V |
| I_{OZ} | OFF-state output current | per input pin; $V_I = V_{IH} \text{ or } V_{IL};$ $V_{CC} = 5.5 \text{ V}; I_O = 0 \text{ A}$ $V_O = V_{CC} \text{ or } \text{GND};$ other pins at $V_{CC} \text{ or } \text{GND}$ | - | - | ± 0.25 | - | ± 2.5 | - | ± 10.0 | μA |
| I_I | input leakage current | $V_I = 5.5 \text{ V or } \text{GND};$ $V_{CC} = 0 \text{ V to } 5.5 \text{ V}$ | - | - | 0.1 | - | 1.0 | - | 2.0 | μA |
| I_{CC} | supply current | $V_I = V_{CC} \text{ or } \text{GND}; I_O = 0 \text{ A};$ $V_{CC} = 5.5 \text{ V}$ | - | - | 4.0 | - | 40 | - | 80 | μA |
| ΔI_{CC} | additional supply current | per input pin; $V_I = V_{CC} - 2.1 \text{ V}; I_O = 0 \text{ A};$ other pins at $V_{CC} \text{ or } \text{GND};$ $V_{CC} = 4.5 \text{ V to } 5.5 \text{ V}$ | - | - | 1.35 | - | 1.5 | - | 1.5 | mA |
| C_I | input capacitance | | - | 3 | 10 | - | 10 | - | 10 | pF |
| C_O | output capacitance | | - | 4.0 | - | - | - | - | - | pF |

10. Dynamic characteristics

Table 7. Dynamic characteristics
GND = 0 V. For test circuit see Figure 8.

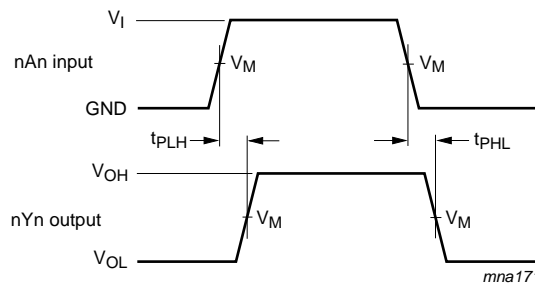
| Symbol | Parameter | Conditions | 25 °C | | | −40 °C to +85 °C | | −40 °C to +125 °C | | Unit |
|----------------------|-------------------------------|---|-------|--------------------|------|------------------|------|-------------------|------|------|
| | | | Min | Typ ^[1] | Max | Min | Max | Min | Max | |
| 74AHC244-Q100 | | | | | | | | | | |
| t_{pd} | propagation delay | nAn to nYn; see Figure 6 ^[2] | | | | | | | | |
| | | $V_{CC} = 3.0\text{ V to }3.6\text{ V}$ | | | | | | | | |
| | | $C_L = 15\text{ pF}$ | - | 5.0 | 8.4 | 1.0 | 10.0 | 1.0 | 10.5 | ns |
| | | $C_L = 50\text{ pF}$ | - | 7.0 | 11.9 | 1.0 | 13.5 | 1.0 | 15.0 | ns |
| | | $V_{CC} = 4.5\text{ V to }5.5\text{ V}$ | | | | | | | | |
| | | $C_L = 15\text{ pF}$ | - | 3.4 | 5.5 | 1.0 | 6.5 | 1.0 | 7.0 | ns |
| t_{en} | enable time | nOE to nYn; see Figure 7 ^[2] | | | | | | | | |
| | | $V_{CC} = 3.0\text{ V to }3.6\text{ V}$ | | | | | | | | |
| | | $C_L = 15\text{ pF}$ | - | 6.5 | 10.6 | 1.0 | 12.5 | 1.0 | 13.5 | ns |
| | | $C_L = 50\text{ pF}$ | - | 7.5 | 14.1 | 1.0 | 16.0 | 1.0 | 18.0 | ns |
| | | $V_{CC} = 4.5\text{ V to }5.5\text{ V}$ | | | | | | | | |
| | | $C_L = 15\text{ pF}$ | - | 4.0 | 7.3 | 1.0 | 8.5 | 1.0 | 9.5 | ns |
| t_{dis} | disable time | nOE to nYn; see Figure 7 ^[2] | | | | | | | | |
| | | $V_{CC} = 3.0\text{ V to }3.6\text{ V}$ | | | | | | | | |
| | | $C_L = 15\text{ pF}$ | - | 5.5 | 9.7 | 1.0 | 11.0 | 1.0 | 12.5 | ns |
| | | $C_L = 50\text{ pF}$ | - | 10.0 | 14.0 | 1.0 | 16.0 | 1.0 | 17.5 | ns |
| | | $V_{CC} = 4.5\text{ V to }5.5\text{ V}$ | | | | | | | | |
| | | $C_L = 15\text{ pF}$ | - | 4.8 | 7.2 | 1.0 | 8.5 | 1.0 | 9.0 | ns |
| C_{PD} | power dissipation capacitance | $C_L = 50\text{ pF}; f_i = 1\text{ MHz}; V_i = \text{GND to }V_{CC}$ ^[3] | - | 10 | - | - | - | - | - | pF |

Table 7. Dynamic characteristics ...continued
GND = 0 V. For test circuit see [Figure 8](#).

| Symbol | Parameter | Conditions | 25 °C | | | -40 °C to +85 °C | | -40 °C to +125 °C | | Unit |
|-----------------------|-------------------------------|--|----------------|--------------------|------|------------------|------|-------------------|------|------|
| | | | Min | Typ ^[1] | Max | Min | Max | Min | Max | |
| 74AHCT244-Q100 | | | | | | | | | | |
| t_{pd} | propagation delay | nAn to nYn ; see Figure 6 ^[2] | | | | | | | | |
| | | $V_{CC} = 4.5\text{ V to }5.5\text{ V}$ | | | | | | | | |
| | | $C_L = 15\text{ pF}$ | - | 3.5 | 7.4 | 1.0 | 8.5 | 1.0 | 9.5 | ns |
| | | $C_L = 50\text{ pF}$ | - | 5.0 | 8.4 | 1.0 | 9.5 | 1.0 | 10.5 | ns |
| t_{en} | enable time | $n\overline{OE}$ to nYn ; see Figure 7 | | | | | | | | |
| | | $V_{CC} = 4.5\text{ V to }5.5\text{ V}$ | | | | | | | | |
| | | $C_L = 15\text{ pF}$ | - | 3.5 | 10.4 | 1.0 | 12.0 | 1.0 | 13.0 | ns |
| | | $C_L = 50\text{ pF}$ | - | 5.5 | 11.4 | 1.0 | 13.0 | 1.0 | 14.5 | ns |
| t_{dis} | disable time | $n\overline{OE}$ to nYn ; see Figure 7 ^[2] | | | | | | | | |
| | | $V_{CC} = 4.5\text{ V to }5.5\text{ V}$ | | | | | | | | |
| | | $C_L = 15\text{ pF}$ | - | 5.0 | 9.4 | 1.0 | 10.0 | 1.0 | 12.0 | ns |
| | | $C_L = 50\text{ pF}$ | - | 7.0 | 11.4 | 1.0 | 13.0 | 1.0 | 14.5 | ns |
| C_{PD} | power dissipation capacitance | per buffer; $C_L = 50\text{ pF}$; $f = 1\text{ MHz}$; $V_I = GND\text{ to }V_{CC}$ | ^[3] | 12 | - | - | - | - | - | pF |

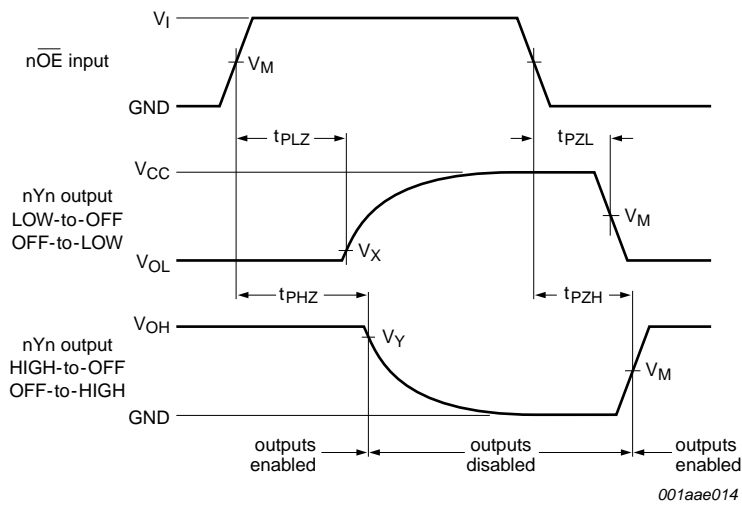
- [1] Typical values are measured at nominal supply voltage ($V_{CC} = 3.3\text{ V}$ and $V_{CC} = 5.0\text{ V}$).
- [2] t_{pd} is the same as t_{PLH} and t_{PHL} .
 t_{en} is the same as t_{PZL} and t_{PZH} .
 t_{dis} is the same as t_{PLZ} and t_{PHZ} .
- [3] C_{PD} is used to determine the dynamic 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.

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 6. Propagation delay input (nAn) to output (nYn)



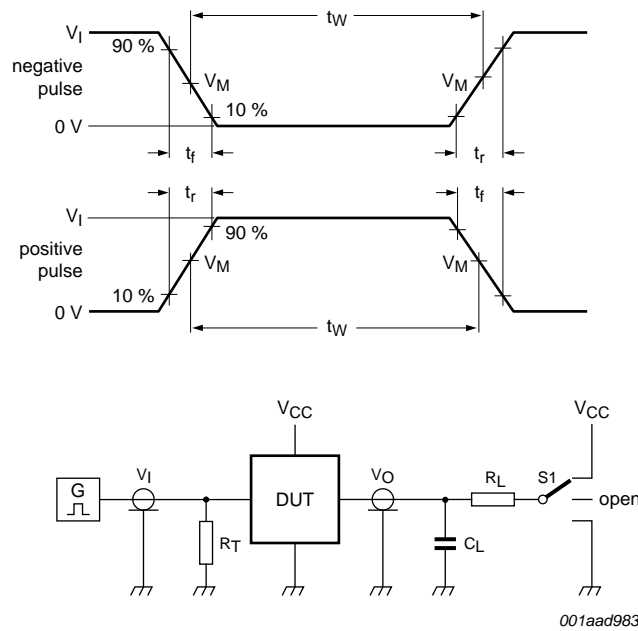
Measurement points are given in [Table 8](#).

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

Fig 7. enable and disable times

Table 8. Measurement points

| Type | Input | Output | | |
|----------------|-------------|-------------|------------------|------------------|
| | V_M | V_M | V_X | V_Y |
| 74AHC244-Q100 | $0.5V_{CC}$ | $0.5V_{CC}$ | $V_{OL} + 0.3 V$ | $V_{OH} - 0.3 V$ |
| 74AHCT244-Q100 | 1.5 V | $0.5V_{CC}$ | $V_{OL} + 0.3 V$ | $V_{OH} - 0.3 V$ |



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 resistor

S1 = Test selection switch

Fig 8. Test circuit for measuring switching times

Table 9. 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} |
| 74AHC244-Q100 | V_{CC} | 3.0 ns | 15 pF, 50 pF | 1 k Ω | open | GND | V_{CC} |
| 74AHCT244-Q100 | 3.0 V | 3.0 ns | 15 pF, 50 pF | 1 k Ω | open | GND | V_{CC} |

12. Package outline

SO20: plastic small outline package; 20 leads; body width 7.5 mm

SOT163-1

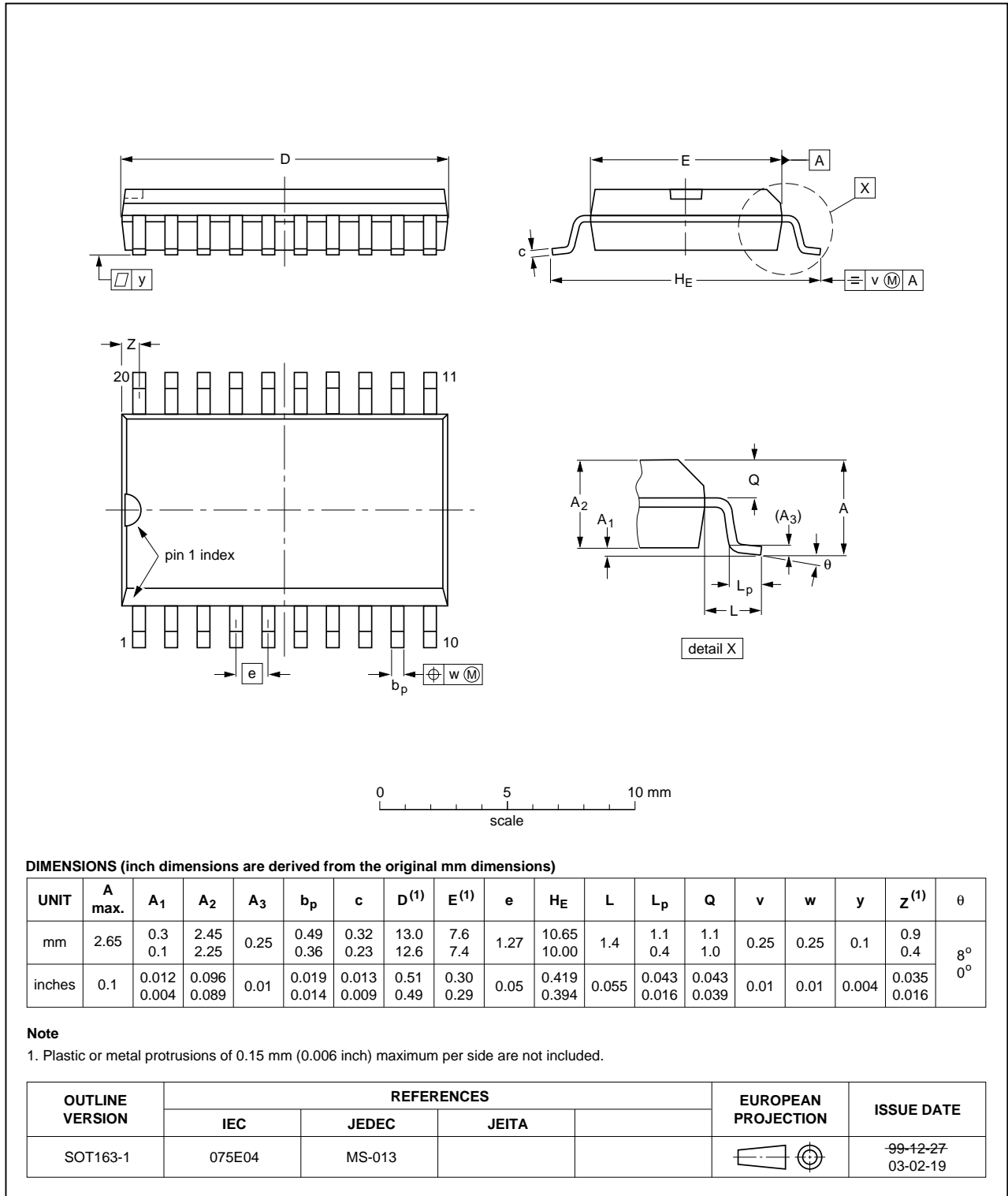


Fig 9. Package outline SOT163-1 (SO20)

TSSOP20: plastic thin shrink small outline package; 20 leads; body width 4.4 mm

SOT360-1

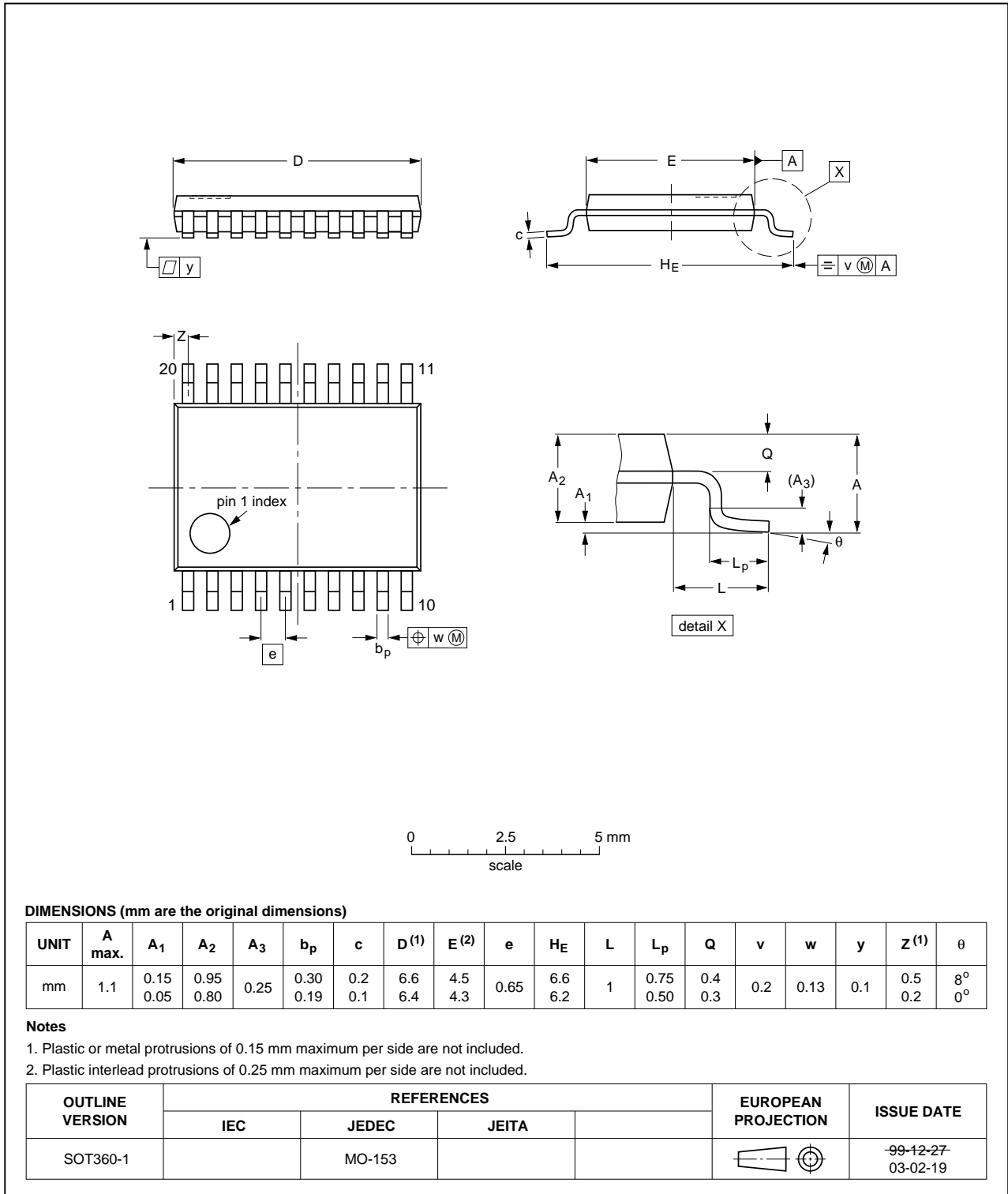


Fig 10. Package outline SOT360-1 (TSSOP20)

DHVQFN20: plastic dual in-line compatible thermal enhanced very thin quad flat package; no leads; 20 terminals; body 2.5 x 4.5 x 0.85 mm

SOT764-1

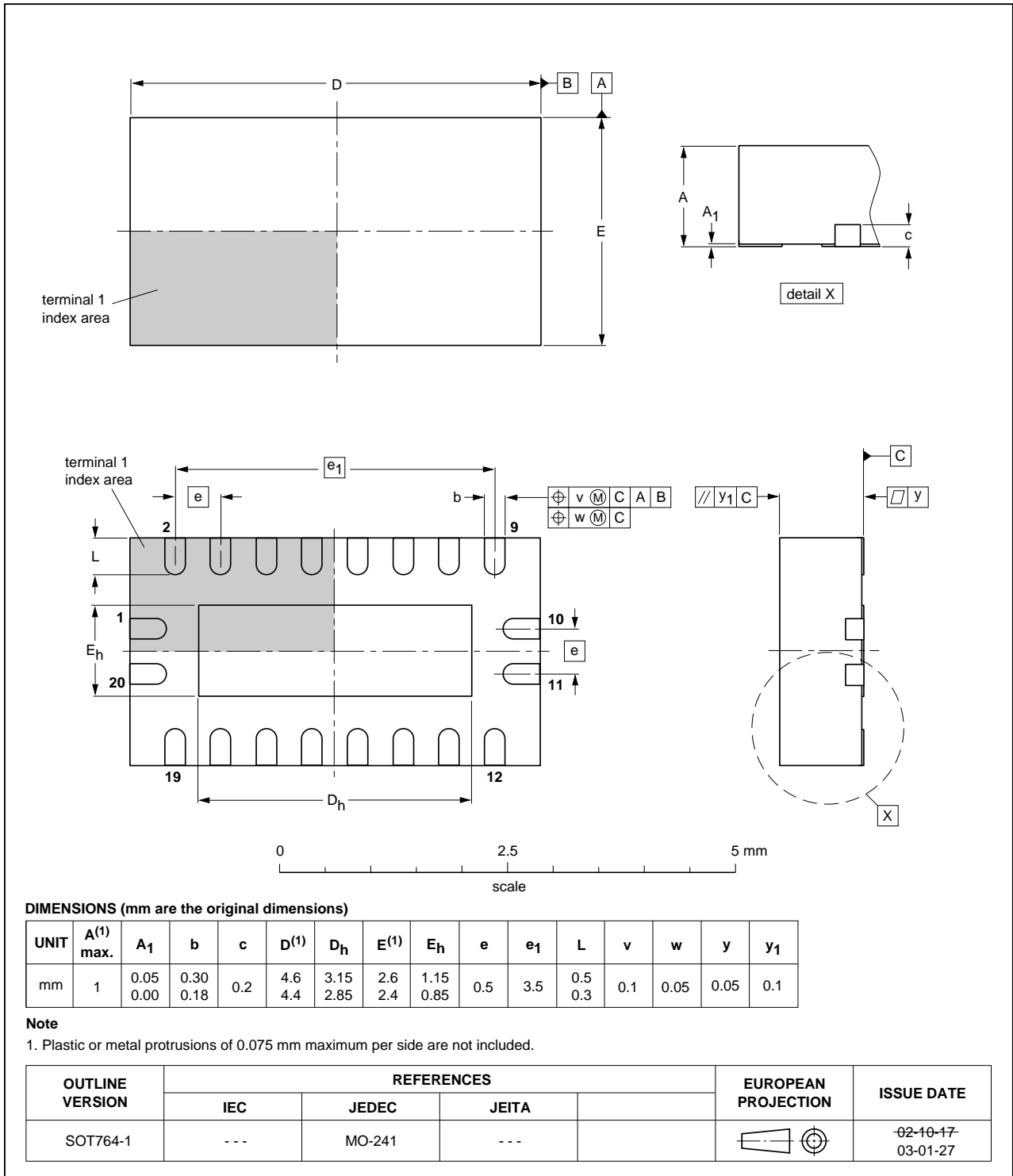


Fig 11. Package outline SOT764-1 (DHVQFN20)

13. Abbreviations

Table 10. Abbreviations

| Acronym | Description |
|---------|---|
| CDM | Charge 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 |
| MIL | Military |

14. Revision history

Table 11. Revision history

| Document ID | Release date | Data sheet status | Change notice | Supersedes |
|------------------------|--------------|--------------------|---------------|------------|
| 74AHC_AHCT244_Q100 v.1 | 20120709 | Product data sheet | - | - |

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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