



74HC2G00-Q100; 74HCT2G00-Q100

Dual 2-input NAND gate

Rev. 3.1 — 13 August 2024

Product data sheet

1. General description

The 74HC2G00-Q100; 74HCT2G00-Q100 is a dual 2-input NAND gate. Inputs include clamp diodes. This enables 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 °C to +85 °C and from -40 °C to +125 °C
- Wide supply voltage range from 2.0 V to 6.0 V
- CMOS low power dissipation
- Input levels:
 - For 74HC2G00-Q100: CMOS level
 - For 74HCT2G00-Q100: TTL level
- Symmetrical output impedance
- High noise immunity
- Balanced propagation delays
- Latch-up performance exceeds 100 mA per JESD 78 Class II Level B
- Complies with JEDEC standards:
 - JESD8C (2.7 V to 3.6 V)
 - JESD7A (2.0 V to 6.0 V)
- ESD protection:
 - HBM: ANSI/ESDA/JEDEC JS-001 class 2 exceeds 2000 V
 - CDM: ANSI/ESDA/JEDEC JS-002 class C3 exceeds 1000 V

3. Ordering information

Table 1. Ordering information

Type number	Package			
	Temperature range	Name	Description	Version
74HC2G00DP-Q100 74HCT2G00DP-Q100	-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
74HC2G00DC-Q100 74HCT2G00DC-Q100	-40 °C to +125 °C	VSSOP8	plastic very thin shrink small outline package; 8 leads; body width 2.3 mm	SOT765-1

4. Marking

Table 2. Marking code

Type number	Marking code ^[1]
74HC2G00DP-Q100	H00
74HCT2G00DP-Q100	T00
74HC2G00DC-Q100	H00
74HCT2G00DC-Q100	T00

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

5. Functional diagram

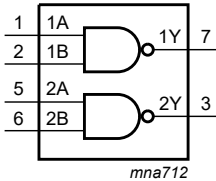


Fig. 1. Logic symbol

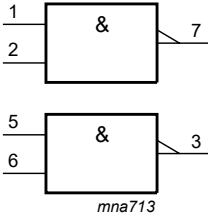


Fig. 2. IEC logic symbol

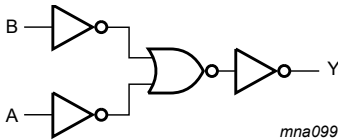
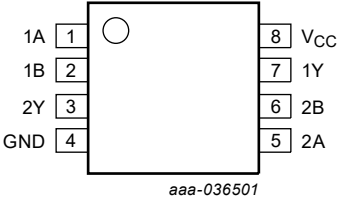


Fig. 3. Logic diagram (one driver)

6. Pinning information

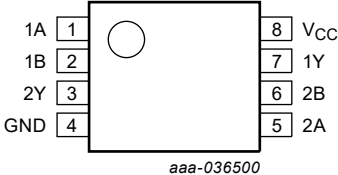
6.1. Pinning

DP package
SOT505-2 (TSSOP8)



aaa-036501

DC package
SOT765-1 (VSSOP8)



aaa-036500

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 _{CC}	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	H
L	H	H
H	L	H
H	H	L

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
I _{IK}	input clamping current	V _I < -0.5 V or V _I > V _{CC} + 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) [1]	-	25	mA
I _{CC}	supply current	[1]	-	50	mA
I _{GND}	ground current	[1]	-50	-	mA
T _{stg}	storage temperature		-65	+150	°C
P _D	dynamic 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 SOT505-2 (TSSOP8) package: P_{tot} derates linearly with 4.6 mW/K above 96 °C.
For SOT765-1 (VSSOP8) package: P_{tot} derates linearly with 4.9 mW/K above 99 °C.

9. Recommended operating conditions

Table 6. Recommended operating conditions

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

Symbol	Parameter	Conditions	74HC2G00-Q100			74HCT2G00-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	-	1.67	139	-	1.67	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 $T_{amb} = 25\text{ }^{\circ}\text{C}$.

Symbol	Parameter	Conditions	-40 °C to +85 °C			-40 °C to +125 °C		Unit
			Min	Typ	Max	Min	Max	
74HC2G00-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 = -4.0 mA; V _{CC} = 4.5 V	4.13	4.32	-	3.7	-	V
		I _O = -5.2 mA; V _{CC} = 6.0 V	5.63	5.81	-	5.2	-	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 = 4.0 mA; V _{CC} = 4.5 V	-	0.15	0.33	-	0.4	V
		I _O = 5.2 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	per input pin; 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
74HCT2G00-Q100								
V _{IH}	HIGH-level input voltage	V _{CC} = 4.5 V to 5.5 V	2.0	1.6	-	2.0	-	V
V _{IL}	LOW-level input voltage	V _{CC} = 4.5 V to 5.5 V	-	1.2	0.8	-	0.8	V
V _{OH}	HIGH-level output voltage	V _I = V _{IH} or V _{IL}						
		I _O = -20 µA; V _{CC} = 4.5 V	4.4	4.5	-	4.4	-	V
		I _O = -4.0 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} = 4.5 V	-	0	0.1	-	0.1	V
		I _O = 4.0 mA; V _{CC} = 4.5 V	-	0.15	0.33	-	0.4	V
I _I	input leakage current	V _I = V _{CC} or GND; V _{CC} = 5.5 V	-	-	±1.0	-	±1.0	µA
I _{CC}	supply current	V _I = V _{CC} or GND; I _O = 0 A; V _{CC} = 5.5 V	-	-	10	-	20	µA
ΔI _{CC}	additional supply current	per input; V _{CC} = 4.5 V to 5.5 V; V _I = V _{CC} - 2.1 V; I _O = 0 A	-	-	375	-	410	µA
C _I	input capacitance		-	1.5	-	-	-	pF

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 Fig. 5.

Symbol	Parameter	Conditions	-40 °C to +85 °C			-40 °C to +125 °C		Unit
			Min	Typ	Max	Min	Max	
74HC2G00-Q100								
t _{pd}	propagation delay	nA and nB to nY; see Fig. 4 [1]						
		V _{CC} = 2.0 V	-	25	95	-	110	ns
		V _{CC} = 4.5 V	-	9	19	-	22	ns
		V _{CC} = 6.0 V	-	7	16	-	20	ns
t _t	transition time	see Fig. 4 [2]						
		V _{CC} = 2.0 V	-	18	95	-	125	ns
		V _{CC} = 4.5 V	-	6	19	-	25	ns
		V _{CC} = 6.0 V	-	5	16	-	20	ns
C _{PD}	power dissipation capacitance	V _I = GND to V _{CC} [3]	-	10	-	-	-	pF
74HCT2G00-Q100								
t _{pd}	propagation delay	nA and nB to nY; see Fig. 4 [1]						
		V _{CC} = 4.5 V	-	12	24	-	29	ns
t _t	transition time	V _{CC} = 4.5 V; see Fig. 4 [2]	-	6	19	-	22	ns
C _{PD}	power dissipation capacitance	V _I = GND to V _{CC} - 1.5 V [3]	-	10	-	-	-	pF

- [1] t_{pd} is the same as t_{PLH} and t_{PHL}.
- [2] t_t is the same as t_{TLH} and t_{THL}.
- [3] C_{PD} is used to determine the dynamic power dissipation (P_D in μW).
 $P_D = C_{PD} \times V_{CC}^2 \times f_i \times N + \Sigma(C_L \times V_{CC}^2 \times f_o)$ 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 outputs.

11.1. Waveforms and test circuit

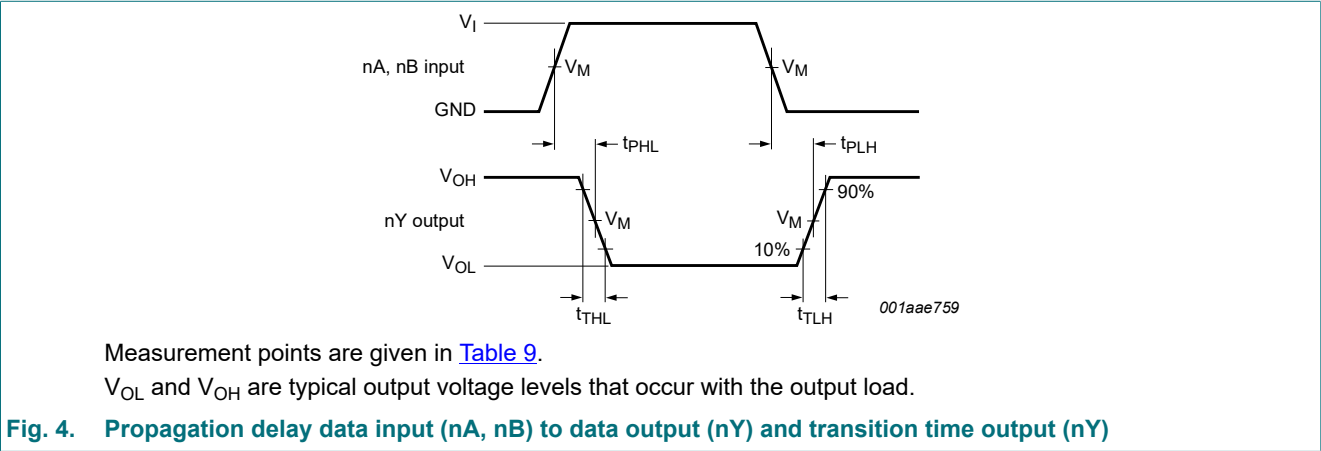


Table 9. Measurement points

Type	Input	Output
	V_M	V_M
74HC2G00-Q100	$0.5 \times V_{CC}$	$0.5 \times V_{CC}$
74HCT2G00-Q100	1.3 V	1.3 V

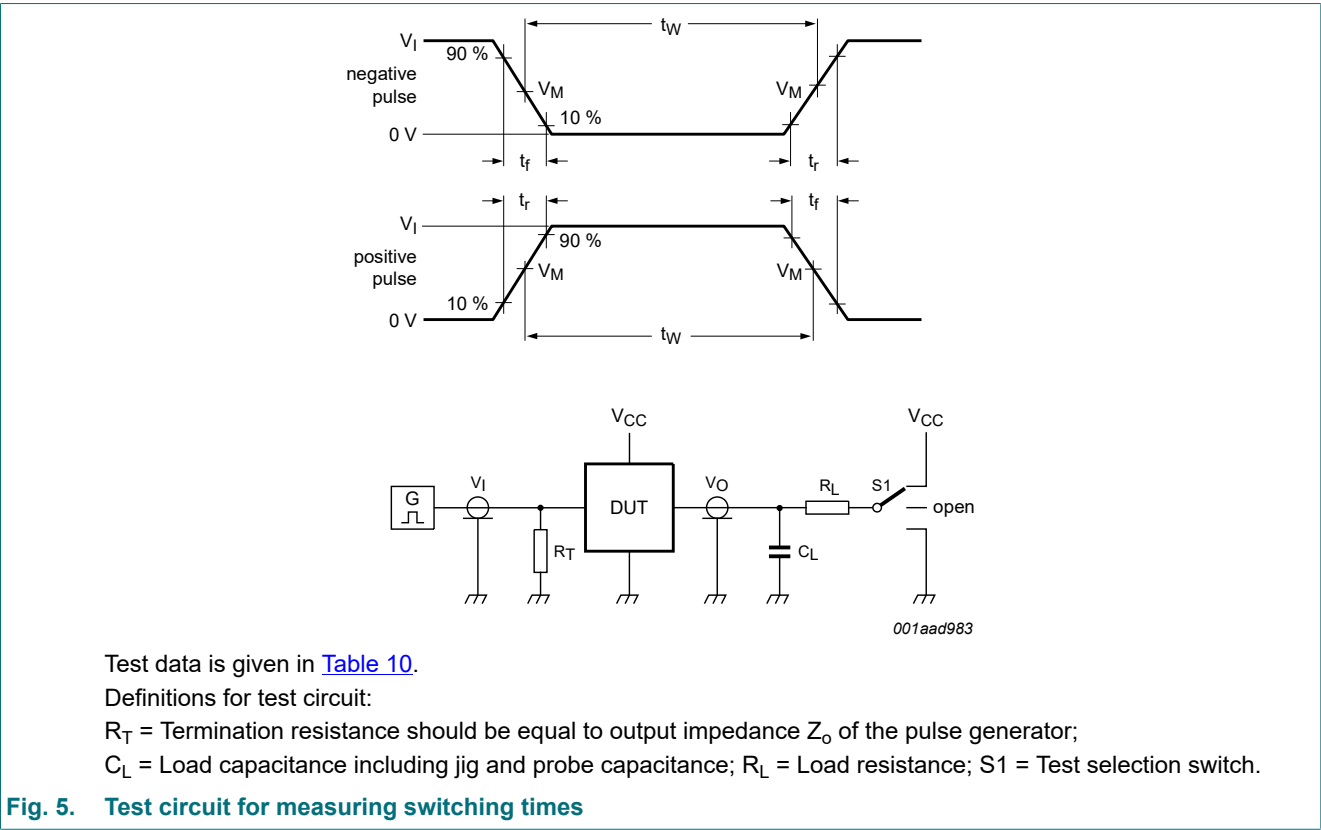


Table 10. Test data

Type	Input		Load		S1 position
	V_I	t_r, t_f	C_L	R_L	t_{PHL}, t_{PLH}
74HC2G00-Q100	V_{CC}	≤ 6 ns	50 pF	1 k Ω	open
74HCT2G00-Q100	3 V	≤ 6 ns	50 pF	1 k Ω	open

12. Package information

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

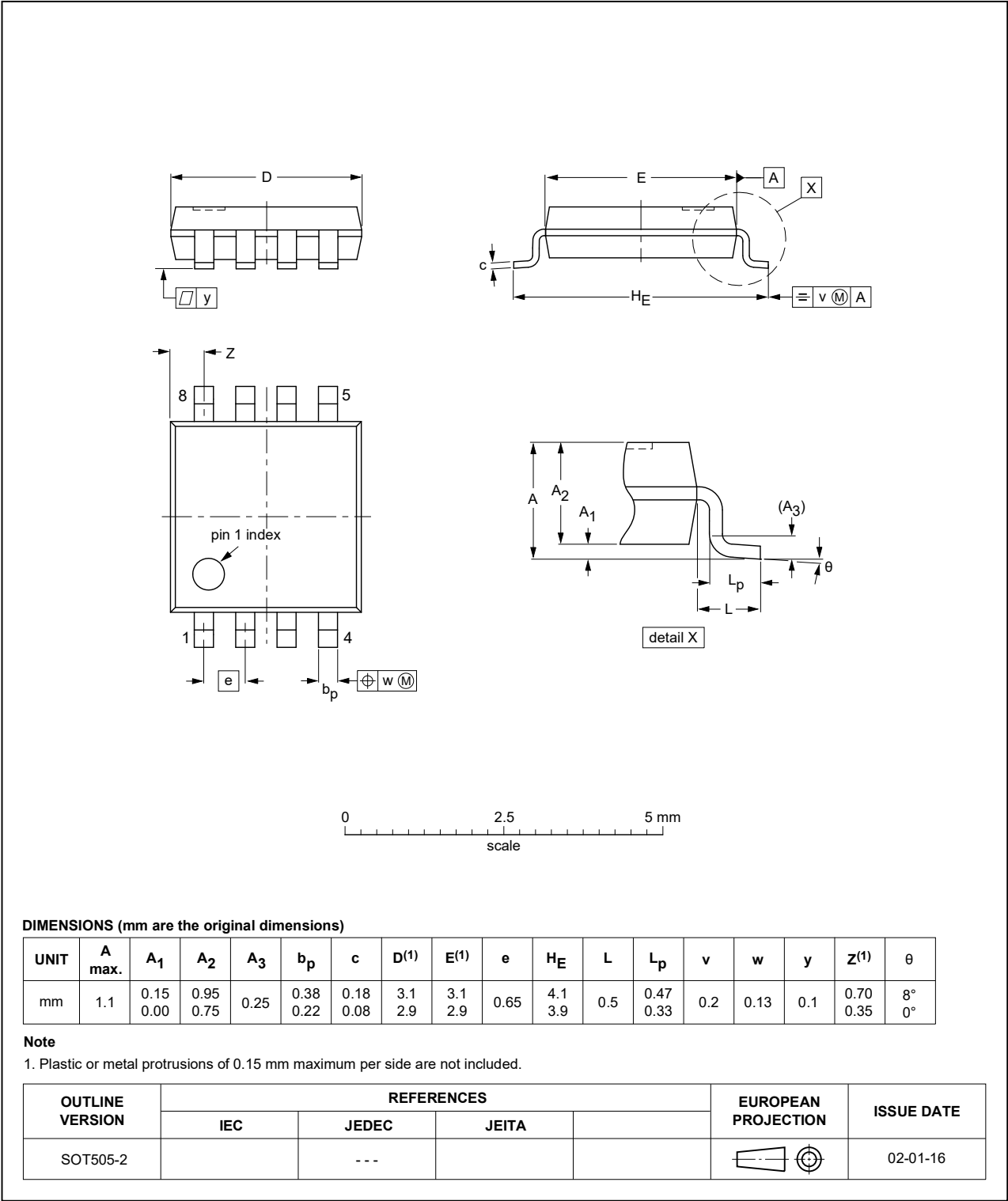


Fig. 6. Package outline SOT505-2 (TSSOP8)

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

SOT765-1

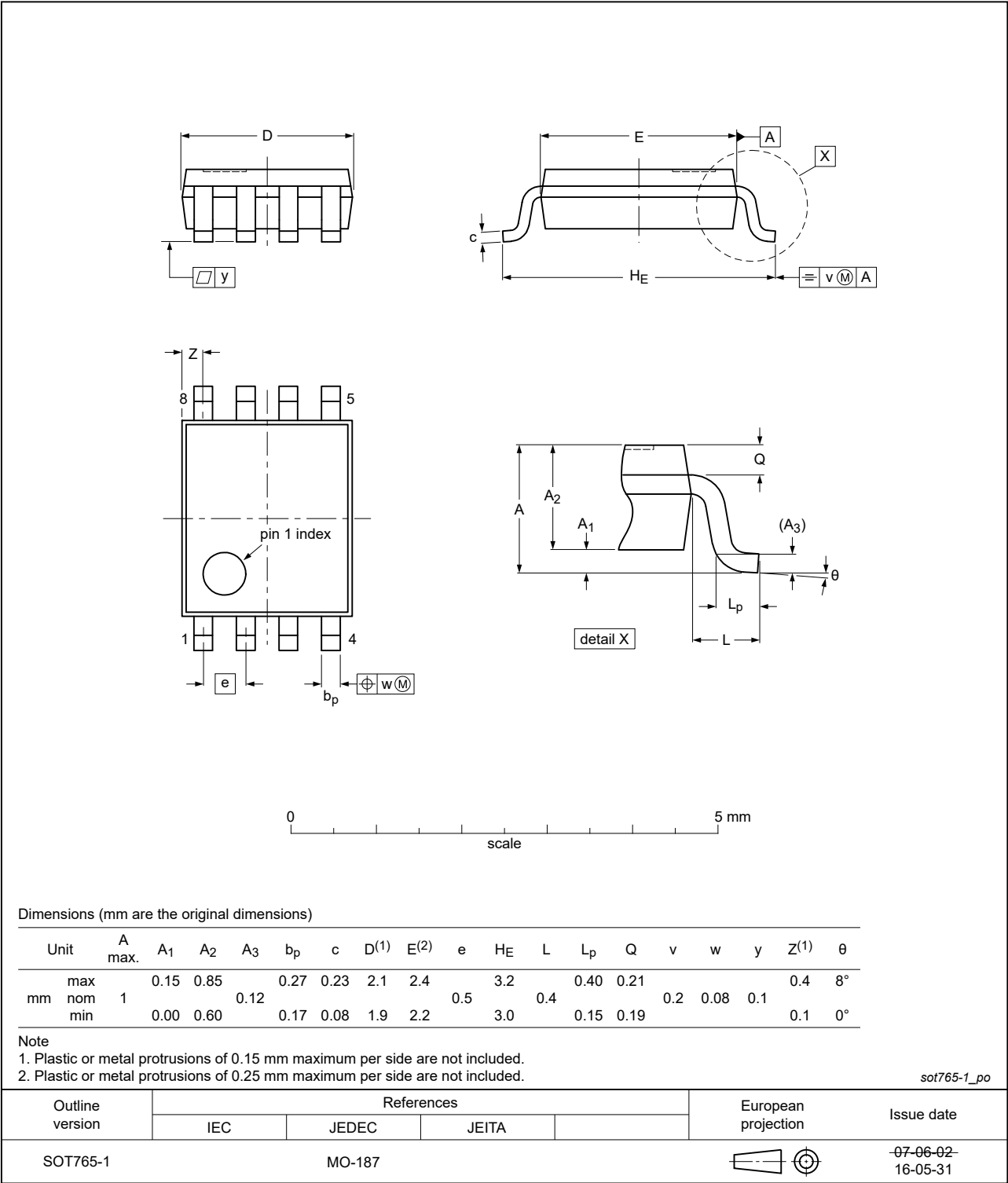


Fig. 7. Package outline SOT765-1 (VSSOP8)

13. Abbreviations

Table 11. Abbreviations

Acronym	Description
ANSI	American National Standards Institute
CMOS	Complementary Metal-Oxide Semiconductor
ESD	ElectroStatic Discharge
ESDA	ElectroStatic Discharge Association
HBM	Human Body Model
JEDEC	Joint Electron Device Engineering Council
TTL	Transistor-Transistor Logic

14. Revision history

Table 12. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
74HC_HCT2G00_Q100 v.3.1	20240813	Product data sheet	-	74HC_HCT2G00_Q100 v.3
74HC_HCT2G00_Q100 v.3	20231201	Product data sheet	-	74HC_HCT2G00_Q100 v.2
Modifications:	Section 2: ESD specification updated according to the latest JEDEC standard.			
74HC_HCT2G00_Q100 v.2	20181120	Product data sheet	-	74HC_HCT2G00_Q100 v.1
Modifications:	- The format of this data sheet has been redesigned to comply with the identity guidelines of Nexperia. - Legal texts have been adapted to the new company name where appropriate.			
74HC_HCT2G00_Q100 v.1	20131107	Product data sheet	-	-

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.

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