



74HC1G86-Q100; 74HCT1G86-Q100

2-input EXCLUSIVE-OR gate

Rev. 4 — 25 June 2024

Product data sheet

1. General description

The 74HC1G86-Q100; 74HCT1G86-Q100 is a single 2-input EXCLUSIVE-OR 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
- Input levels:
 - For 74HC1G86-Q100: CMOS level
 - For 74HCT1G86-Q100: TTL level
- CMOS low power dissipation
- High noise immunity
- Symmetrical output impedance
- 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
74HC1G86GW-Q100 74HCT1G86GW-Q100	-40 °C to +125 °C	TSSOP5	plastic thin shrink small outline package; 5 leads; body width 1.25 mm	SOT353-1
74HC1G86GV-Q100 74HCT1G86GV-Q100	-40 °C to +125 °C	SC-74A	plastic surface-mounted package; 5 leads	SOT753

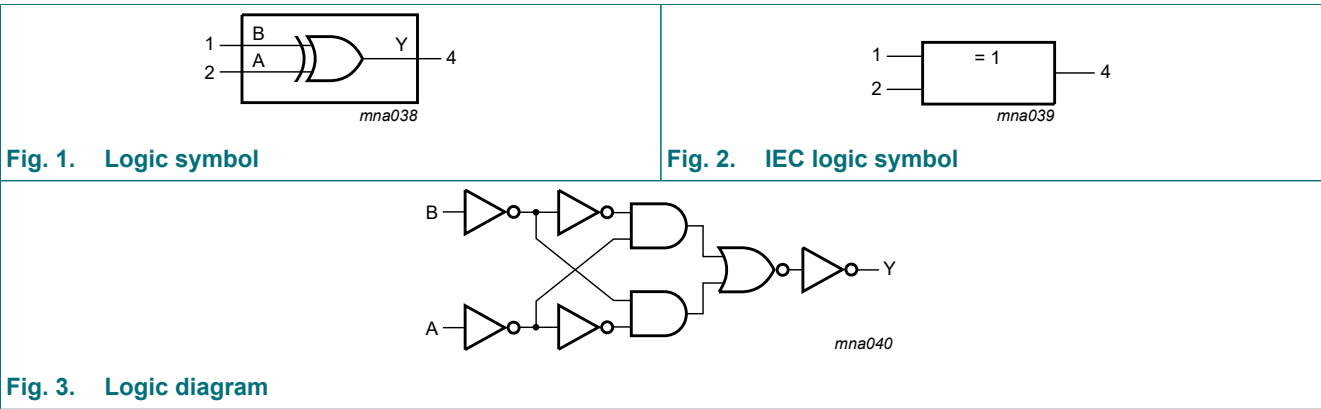
4. Marking

Table 2. Marking codes

Type number	Marking ^[1]
74HC1G86GW-Q100	HH
74HCT1G86GW-Q100	TH
74HC1G86GV-Q100	H86
74HCT1G86GV-Q100	T86

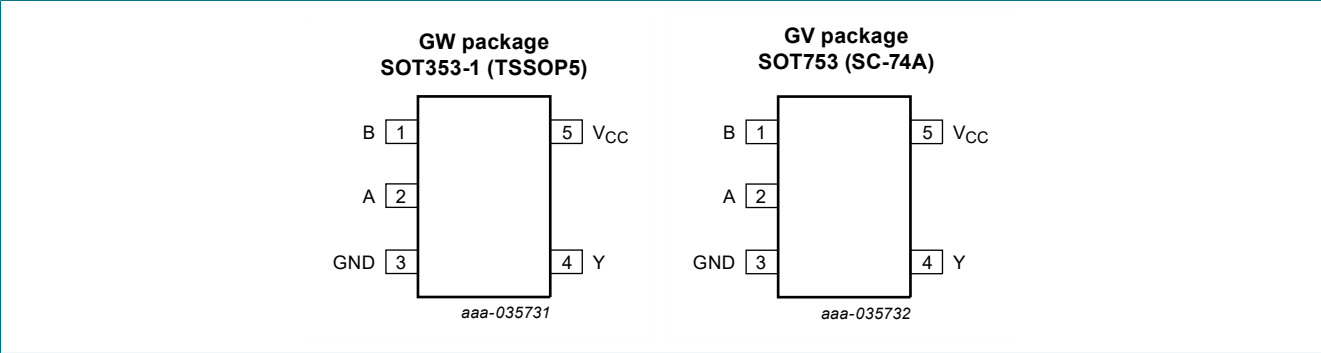
[1] The pin 1 indicator is located on the lower left corner of the device, below the marking code.

5. Functional diagram



6. Pinning information

6.1. Pinning



6.2. Pin description

Table 3. Pin description

Symbol	Pin	Description
B	1	data input
A	2	data input
GND	3	ground (0 V)
Y	4	data output
V _{CC}	5	supply voltage

7. Functional description

Table 4. Function table

H = HIGH voltage level; L = LOW voltage level

Inputs		Output
A	B	Y
L	L	L
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	-	±20	mA
I _{OK}	output clamping current	V _O < -0.5 V or V _O > V _{CC} + 0.5 V	-	±20	mA
I _O	output current	-0.5 V < V _O < V _{CC} + 0.5 V [1]	-	±12.5	mA
I _{CC}	supply current		-	25	mA
I _{GND}	ground current		-25	-	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 SOT353-1 (TSSOP5) package: P_{tot} derates linearly with 3.3 mW/K above 74 °C.
For SOT753 (SC-74A) package: P_{tot} derates linearly with 3.8 mW/K above 85 °C.

9. Recommended operating conditions

Table 6. Recommended operating conditions

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

Symbol	Parameter	Conditions	74HC1G86-Q100			74HCT1G86-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	-	-	139	-	-	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 °C.

Symbol	Parameter	Conditions	-40 °C to +85 °C			-40 °C to +125 °C		Unit
			Min	Typ	Max	Min	Max	
74HC1G86-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 = -2.0 mA; V _{CC} = 4.5 V	4.13	4.32	-	3.7	-	V
		I _O = -2.6 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 = 2.0 mA; V _{CC} = 4.5 V	-	0.15	0.33	-	0.4	V
		I _O = 2.6 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	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

Symbol	Parameter	Conditions	-40 °C to +85 °C			-40 °C to +125 °C		Unit
			Min	Typ	Max	Min	Max	
74HCT1G86-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 = -2.0 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 = 2.0 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	-	-	500	-	850	µA
C _I	input capacitance		-	1.5	-	-	-	pF

11. Dynamic characteristics

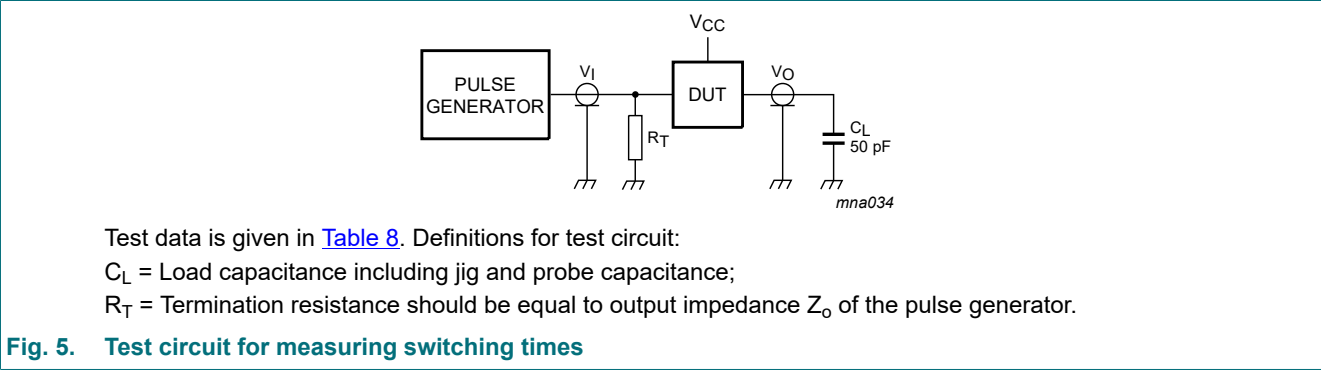
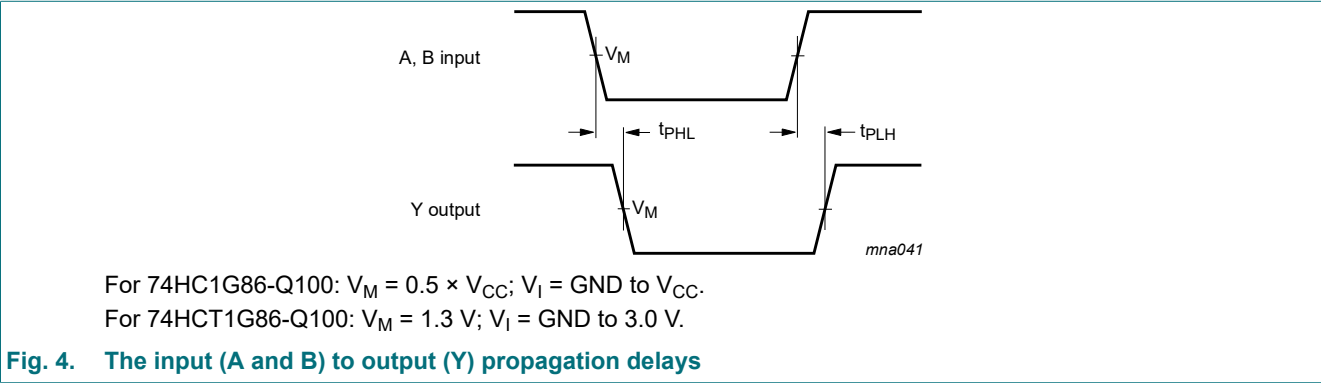
Table 8. Dynamic characteristics

GND = 0 V; t_r = t_f ≤ 6.0 ns; All typical values are measured at T_{amb} = 25 °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	
74HC1G86-Q100								
t _{pd}	propagation delay	A and B to Y; see Fig. 4 [1]						
		V _{CC} = 2.0 V; C _L = 50 pF	-	22	115	-	135	ns
		V _{CC} = 4.5 V; C _L = 50 pF	-	11	23	-	27	ns
		V _{CC} = 5.0 V; C _L = 15 pF	-	9	-	-	-	ns
		V _{CC} = 6.0 V; C _L = 50 pF	-	9	20	-	23	ns
C _{PD}	power dissipation capacitance	V _I = GND to V _{CC} [2]	-	23	-	-	-	pF
74HCT1G86-Q100								
t _{pd}	propagation delay	A and B to Y; see Fig. 4 [1]						
		V _{CC} = 4.5 V; C _L = 50 pF	-	13	23	-	27	ns
		V _{CC} = 5.0 V; C _L = 15 pF	-	10	-	-	-	ns
C _{PD}	power dissipation capacitance	V _I = GND to V _{CC} - 1.5 V [2]	-	23	-	-	-	pF

[1] t_{pd} is the same as t_{PLH} and t_{PHL}.
[2] C_{PD} is used to determine the dynamic power dissipation P_D (µW).
P_D = C_{PD} × V_{CC}² × f_i + Σ(C_L × V_{CC}² × 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
Σ(C_L × V_{CC}² × f_o) = sum of outputs

11.1. Waveforms and test circuit



12. Package outline

TSSOP5: plastic thin shrink small outline package; 5 leads; body width 1.25 mm

SOT353-1

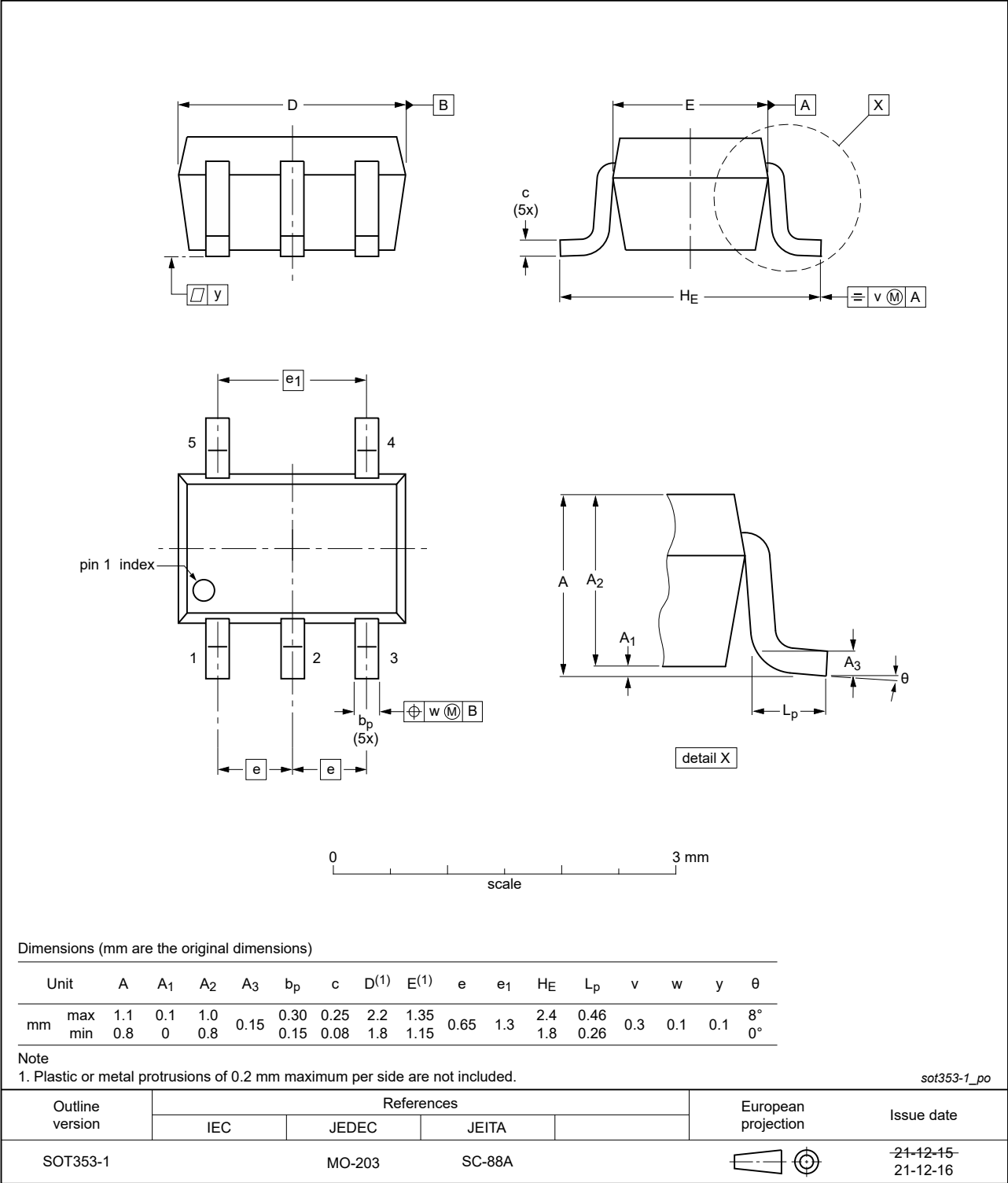


Fig. 6. Package outline SOT353-1 (TSSOP5)

Plastic surface-mounted package; 5 leads

SOT753

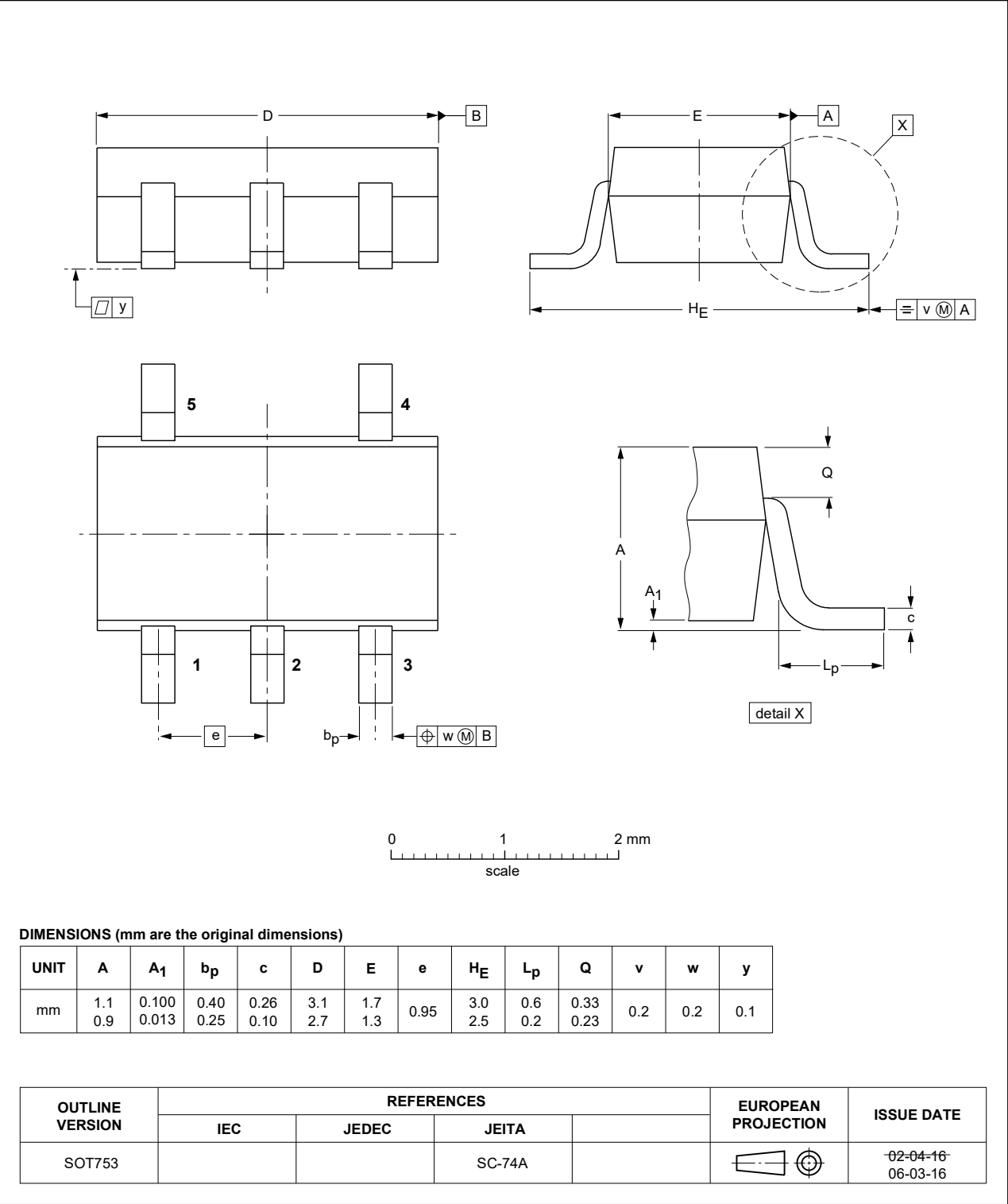


Fig. 7. Package outline SOT753 (SC-74A)

13. Abbreviations

Table 9. Abbreviations

Acronym	Description
ANSI	American National Standards Institute
CDM	Charged Device Model
CMOS	Complementary Metal Oxide Semiconductor
DUT	Device Under Test
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 10. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
74HC_HCT1G86_Q100 v.4	20240625	Product data sheet	-	74HC_HCT1G86_Q100 v.3
Modifications:	Section 2 : ESD specification updated according to the latest JEDEC standard.			
74HC_HCT1G86_Q100 v.3	20220127	Product data sheet	-	74HC_HCT1G86_Q100 v.2
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. Section 1 and Section 2 updated. Table 5: Derating values for P_{tot} total power dissipation updated. Fig. 6: Package outline drawing for SOT353-1 (TSSOP5) has changed.			
74HC_HCT1G86_Q100 v.2	20131216	Product data sheet	-	74HC_HCT1G86_Q100 v.1
Modifications:	Features and benefits updated (errata).			
74HC_HCT1G86_Q100 v.1	20130326	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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Date of release: 25 June 2024