

74HC1G125-Q100; 74HCT1G125-Q100

Bus buffer/line driver; 3-state

Rev. 3 — 27 November 2023

Product data sheet

1. General description

The 74HC1G125-Q100; 74HCT1G125-Q100 is a single buffer/line driver with 3-state output. 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
- High noise immunity
- Latch-up performance exceeds 100 mA per JESD 78 Class II Level B
- Input levels:
 - For 74HC1G125-Q100: CMOS level
 - For 74HCT1G125-Q100: TTL level
- Symmetrical output impedance
- High noise immunity
- Balanced propagation delays
- 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
74HC1G125GW-Q100	-40 °C to +125 °C	TSSOP5	plastic thin shrink small outline package; 5 leads; body width 1.25 mm	SOT353-1
74HCT1G125GW-Q100				
74HC1G125GV-Q100	-40 °C to +125 °C	SC-74A	plastic surface-mounted package; 5 leads	SOT753
74HCT1G125GV-Q100				

4. Marking

Table 2. Marking

Type number	Marking code ^[1]
74HC1G125GW-Q100	HM
74HCT1G125GW-Q100	TM
74HC1G125GV-Q100	H25
74HCT1G125GV-Q100	T25

[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

6. Pinning information

6.1. Pinning

Fig. 4. Pin configuration SOT353-1 (TSSOP5)

Fig. 5. Pin configuration SOT753 (SC-74A)

6.2. Pin description

Table 3. Pin description

Symbol	Pin	Description
OE	1	output enable input (active LOW)
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; X = don't care; Z = high-impedance OFF-state.

Control	Input	Output
OE	A	Y
L	L	L
L	H	H
H	X	Z

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	$V_I < -0.5\text{ V}$ or $V_I > V_{CC} + 0.5\text{ V}$ [1]	-	±20	mA
I_{OK}	output clamping current	$V_O < -0.5\text{ V}$ or $V_O > V_{CC} + 0.5\text{ V}$ [1]	-	±20	mA
I_O	output current	$V_O = -0.5\text{ V}$ to $(V_{CC} + 0.5\text{ V})$ [1]	-	±35	mA
I_{CC}	supply current		-	70	mA
I_{GND}	ground current		-70	-	mA
T_{stg}	storage temperature		-65	+150	°C
P_{tot}	total power dissipation	$T_{amb} = -40\text{ °C}$ to $+125\text{ °C}$ [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	74HC1G125-Q100			74HCT1G125-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
$\Delta t/\Delta V$	input transition rise and fall rate	$V_{CC} = 2.0\text{ V}$	-	-	625	-	-	-	ns/V
		$V_{CC} = 4.5\text{ V}$	-	1.67	139	-	1.67	139	ns/V
		$V_{CC} = 6.0\text{ V}$	-	-	83	-	-	-	ns/V

10. Static characteristics

Table 7. Static characteristics 74HC1G125-Q100

At recommended operating conditions; voltages are referenced to GND (ground = 0 V).

Symbol	Parameter	Conditions	-40 °C to +85 °C			-40 °C to +125 °C		Unit
			Min	Typ[1]	Max	Min	Max	
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 = -6.0 mA; V _{CC} = 4.5 V	3.84	4.32	-	3.7	-	V
		I _O = -7.8 mA; V _{CC} = 6.0 V	5.34	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 = 6.0 mA; V _{CC} = 4.5 V	-	0.15	0.33	-	0.4	V
		I _O = 7.8 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 _{OZ}	OFF-state output current	V _I = V _{IH} or V _{IL} ; V _O = V _{CC} or GND; V _{CC} = 6.0 V	-	-	5	-	10	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

[1] All typical values are measured at T_{amb} = 25 °C.

Table 8. Static characteristics 74HCT1G125-Q100

At recommended operating conditions; voltages are referenced to GND (ground = 0 V).

Symbol	Parameter	Conditions	-40 °C to +85 °C			-40 °C to +125 °C		Unit
			Min	Typ[1]	Max	Min	Max	
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} ; V _{CC} = 4.5 V						
		I _O = -20 µA	4.4	4.5	-	4.4	-	V
		I _O = -6.0 mA	3.84	4.32	-	3.7	-	V
V _{OL}	LOW-level output voltage	V _I = V _{IH} or V _{IL} ; V _{CC} = 4.5 V						
		I _O = 20 µA	-	0	0.1	-	0.1	V
		I _O = 6.0 mA	-	0.16	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 _{OZ}	OFF-state output current	V _I = V _{IH} or V _{IL} ; V _O = V _{CC} or GND; V _{CC} = 5.5 V	-	-	5	-	10	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	V _I = V _{CC} - 2.1 V; I _O = 0 A; V _{CC} = 4.5 V to 5.5 V	-	-	500	-	850	µA
C _I	input capacitance		-	1.5	-	-	-	pF

[1] All typical values are measured at T_{amb} = 25 °C.

11. Dynamic characteristics

Table 9. Dynamic characteristics

Voltages are referenced to GND (ground = 0 V); $C_L = 50$ pF unless otherwise specified; for test circuit see Fig. 8

Symbol	Parameter	Conditions	-40 °C to +85 °C			-40 °C to +125 °C		Unit
			Min	Typ[1]	Max	Min	Max	
74HC1G125-Q100								
t _{pd}	propagation delay	A to Y; see Fig. 6 [2]						
		V _{CC} = 2.0 V	-	24	125	-	150	ns
		V _{CC} = 4.5 V	-	10	25	-	30	ns
		V _{CC} = 5 V; C _L = 15 pF	-	9	-	-	-	ns
		V _{CC} = 6.0 V	-	8	21	-	26	ns
t _{en}	enable time	OE to Y; see Fig. 7 [2]						
		V _{CC} = 2.0 V	-	19	155	-	190	ns
		V _{CC} = 4.5 V	-	9	31	-	38	ns
		V _{CC} = 6.0 V	-	7	26	-	32	ns
t _{dis}	disable time	OE to Y; see Fig. 7 [2]						
		V _{CC} = 2.0 V	-	18	155	-	190	ns
		V _{CC} = 4.5 V	-	12	31	-	38	ns
		V _{CC} = 6.0 V	-	11	26	-	32	ns
C _{PD}	power dissipation capacitance	V _I = GND to V _{CC} [3]	-	30	-	-	-	pF
74HCT1G125-Q100								
t _{pd}	propagation delay	A to Y; see Fig. 6 [2]						
		V _{CC} = 4.5 V	-	11	30	-	36	ns
		V _{CC} = 5 V; C _L = 15 pF	-	10	-	-	-	ns
t _{en}	enable time	V _{CC} = 4.5 V; OE to Y; see Fig. 7 [2]	-	10	35	-	42	ns
t _{dis}	disable time	V _{CC} = 4.5 V; OE to Y; see Fig. 7 [2]	-	11	31	-	38	ns
C _{PD}	power dissipation capacitance	V _I = GND to V _{CC} - 1.5 V [3]	-	27	-	-	-	pF

[1] All typical values are measured at $T_{amb} = 25$ °C.

[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 in μ 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

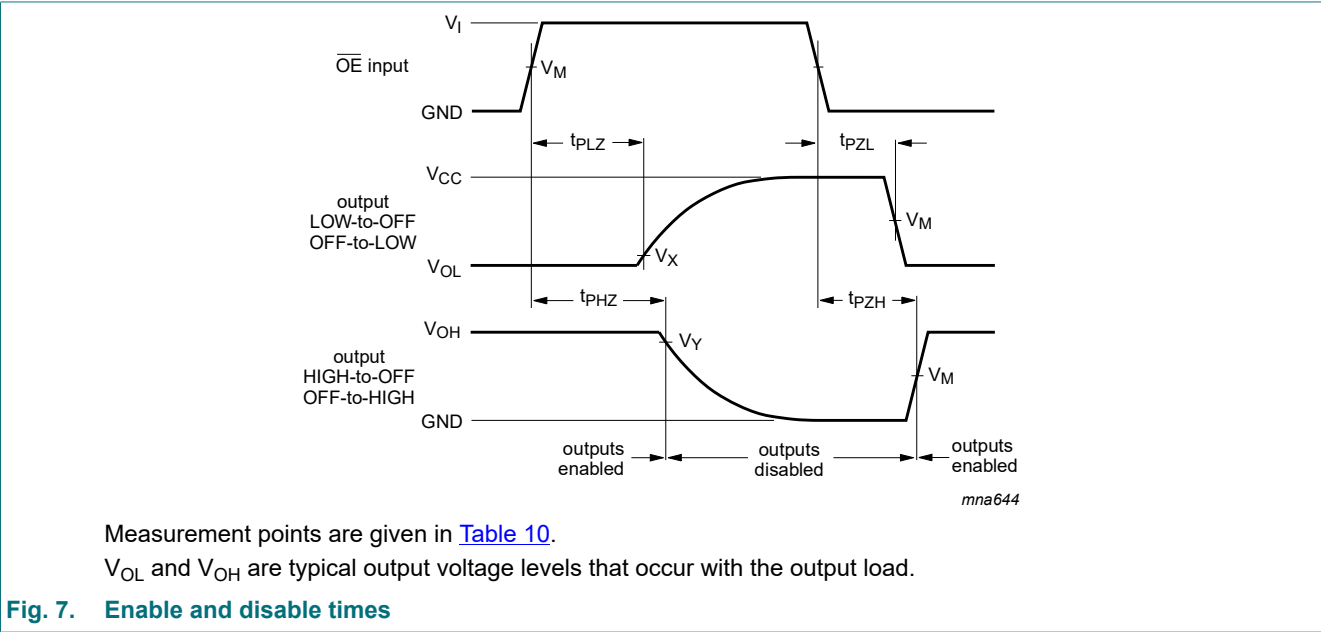
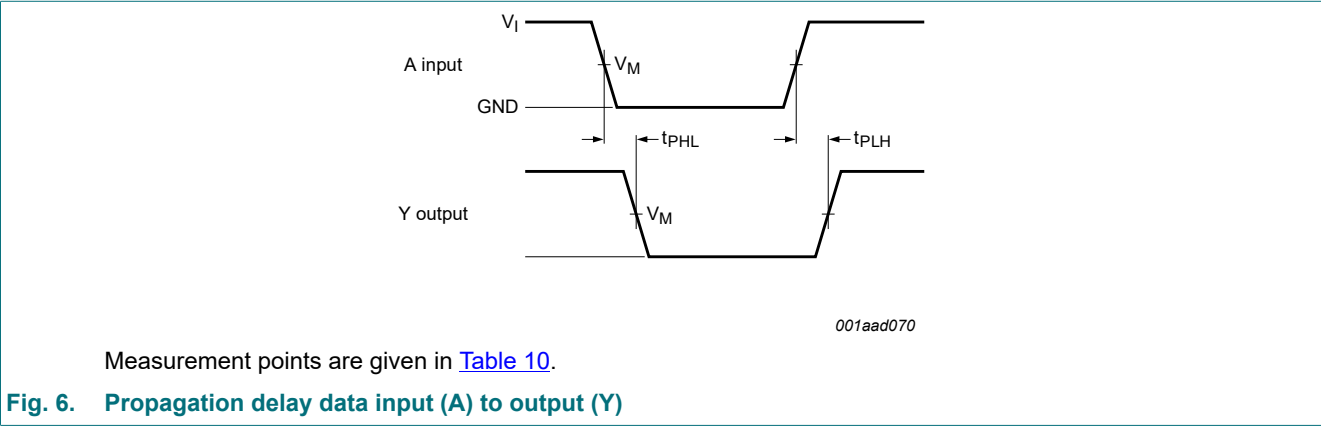


Table 10. Measurement points

Type	Input	Output		
	V_M	V_M	V_X	V_Y
74HC1G125-Q100	$0.5V_{CC}$	$0.5V_{CC}$	$V_{OL} + 0.3\text{ V}$	$V_{OH} - 0.3\text{ V}$
74HCT1G125-Q100	1.3 V	1.3 V	$V_{OL} + 0.3\text{ V}$	$V_{OH} - 0.3\text{ V}$

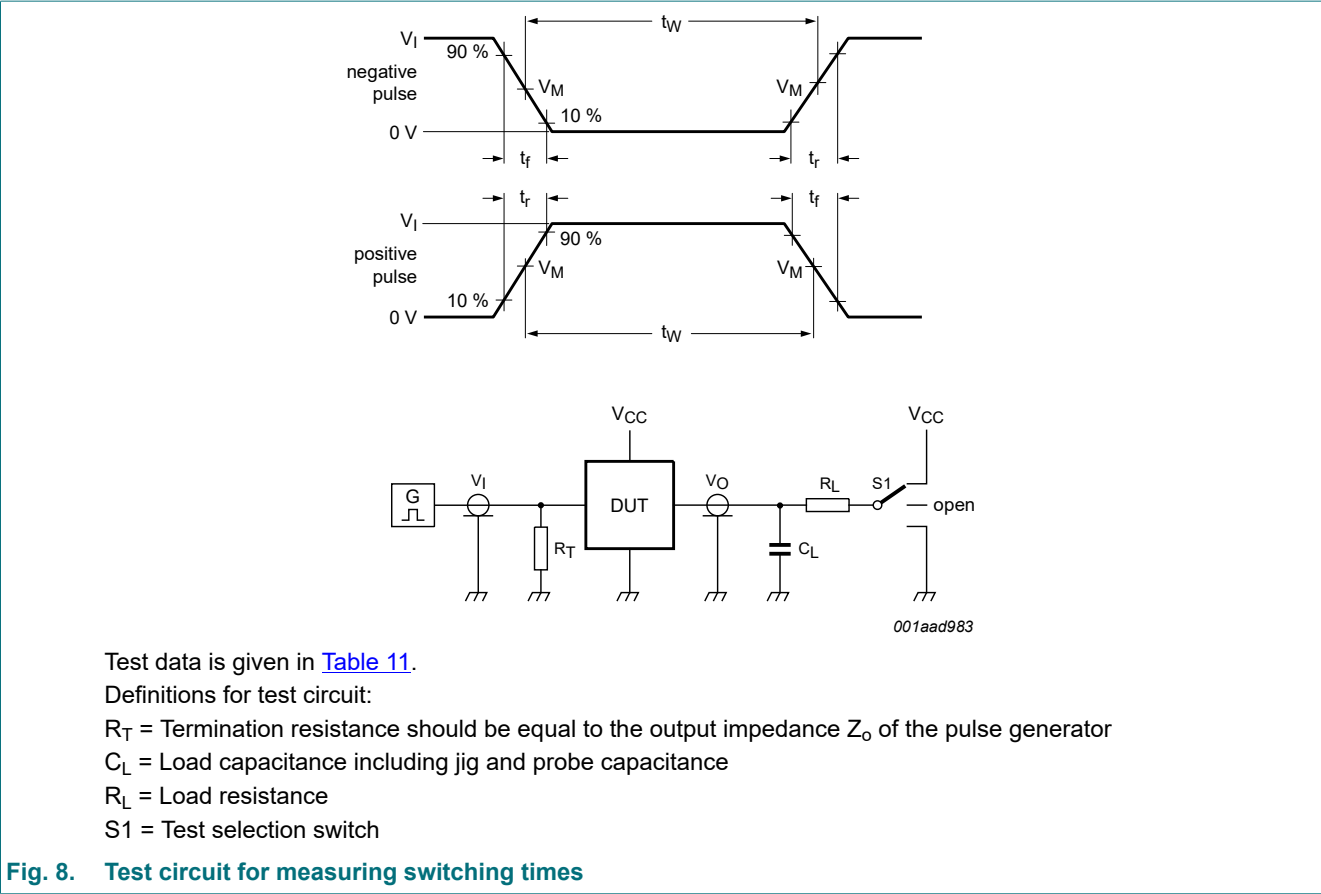


Table 11. Test data

Type	Input		Load		S1 position		
	V_I	t_r, t_f	C_L	R_L	t_{PLH}, t_{PHL}	t_{PZH}, t_{PHZ}	t_{PZL}, t_{PLZ}
74HC1G125-Q100	V_{CC}	6 ns	15 pF, 50 pF	1 k Ω	open	GND	V_{CC}
74HCT1G125-Q100	3 V	6 ns	15 pF, 50 pF	1 k Ω	open	GND	V_{CC}

12. Package outline

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

SOT353-1

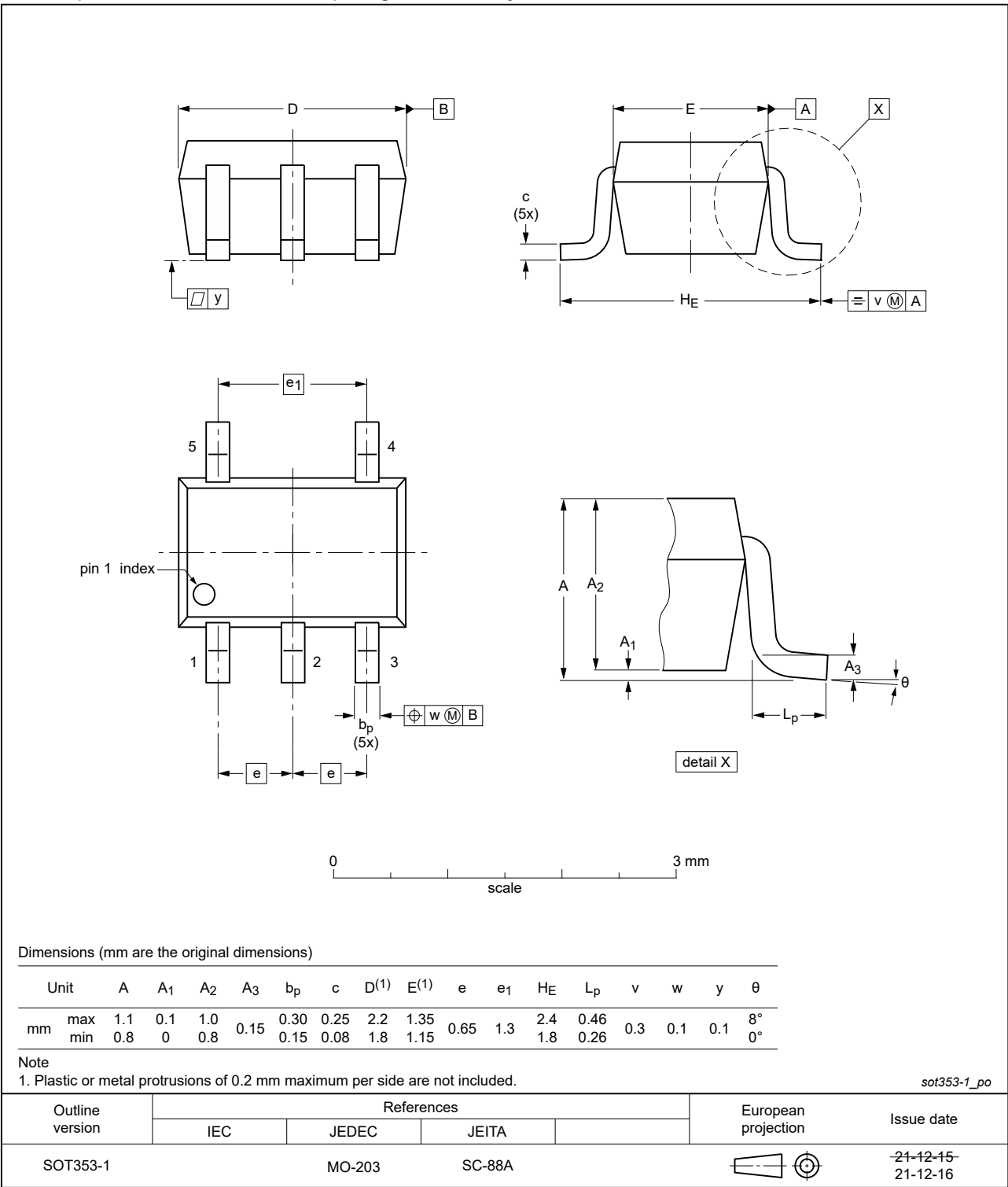


Fig. 9. Package outline SOT353-1 (TSSOP5)

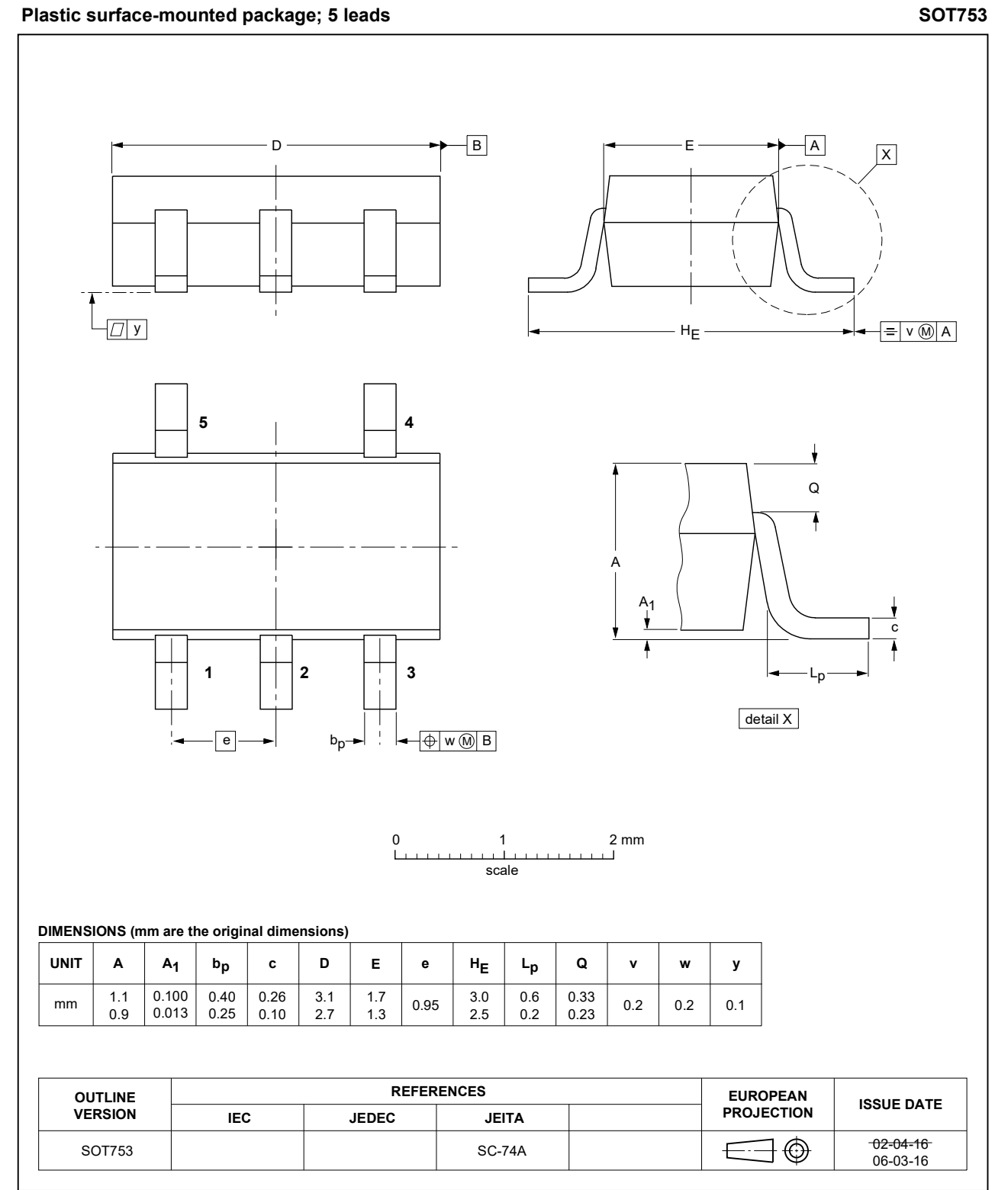


Fig. 10. Package outline SOT753 (SC-74A)

13. Abbreviations

Table 12. Abbreviations

Acronym	Description
CMOS	Complementary Metal-Oxide Semiconductor
DUT	Device Under Test
ESD	ElectroStatic Discharge
HBM	Human Body Model
TTL	Transistor-Transistor Logic

14. Revision history

Table 13. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
74HC_HCT1G125_Q100 v.3	20231127	Product data sheet	-	74HC_HCT1G125_Q100 v.2
Modifications:	Section 2: ESD specification updated according to the latest JEDEC standard.			
74HC_HCT1G125_Q100 v.2	20220117	Product data sheet	-	74HC_HCT1G125_Q100 v.1
Modifications:	Section 2 updated. Section 8: Derating values for P_{tot} total power dissipation updated. Fig. 9: Package outline drawing SOT353-1 (TSSOP5) has changed.			
74HC_HCT1G125_Q100 v.1	20130618	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.

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