



74HC125-Q100; 74HCT125-Q100

Quad buffer/line driver; 3-state

Rev. 4 — 22 February 2024

Product data sheet

1. General description

The 74HC125-Q100; 74HCT125-Q100 is a quad buffer/line driver with 3-state outputs controlled by the output enable inputs (\overline{nOE}). A HIGH on \overline{nOE} causes the outputs to assume a high impedance OFF-state. Inputs include clamp diodes which enable 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

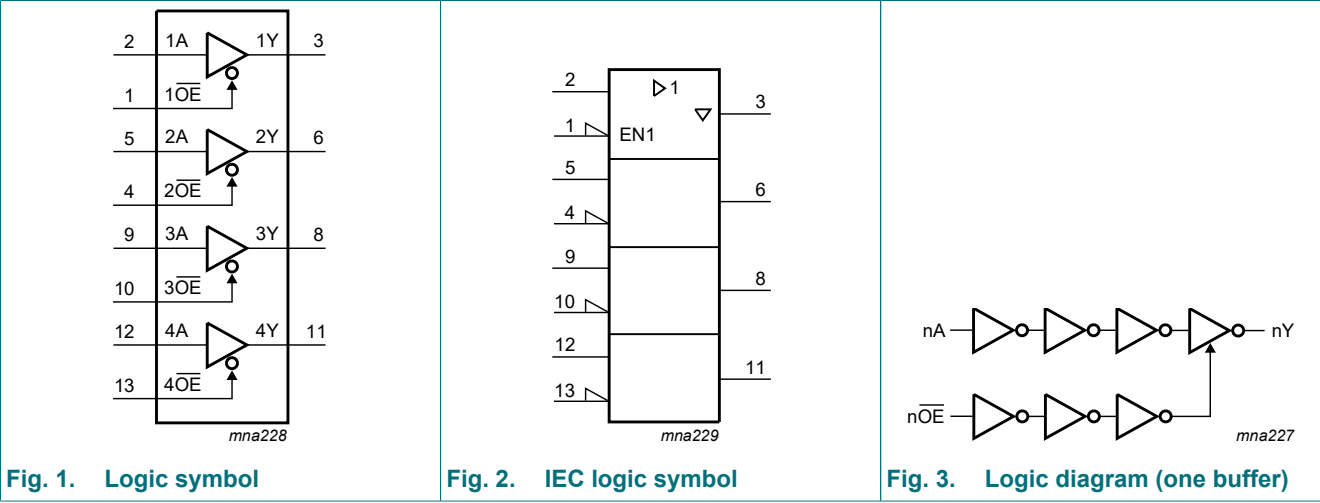
- Automotive product qualification in accordance with AEC-Q100 (Grade 1)
 - Specified from -40 °C to +85 °C and from -40 °C to +125 °C
- Wide supply voltage range from 2.0 V to 6.0 V
- CMOS low power dissipation
- High noise immunity
- Latch-up performance exceeds 100 mA per JESD 78 Class II Level B
- Complies with JEDEC standards:
 - JESD8C (2.7 V to 3.6 V)
 - JESD7A (2.0 V to 6.0 V)
- Input levels:
 - The 74HC125-Q100: CMOS levels
 - The 74HCT125-Q100: TTL levels
- 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

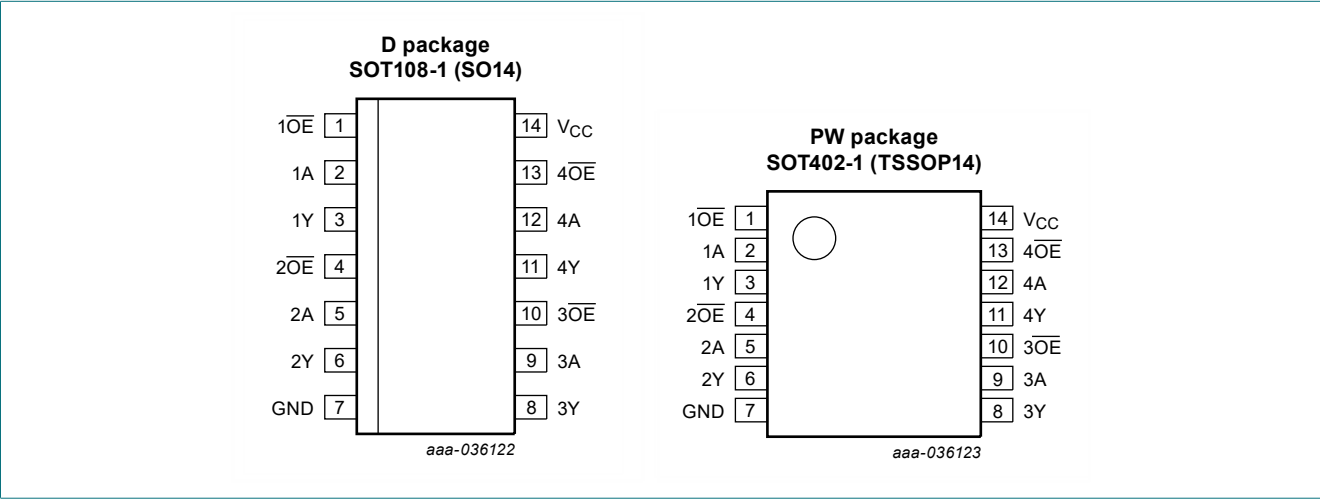
Type number	Package			
	Temperature range	Name	Description	Version
74HC125D-Q100 74HCT125D-Q100	-40 °C to +125 °C	SO14	plastic small outline package; 14 leads; body width 3.9 mm	SOT108-1
74HC125PW-Q100 74HCT125PW-Q100	-40 °C to +125 °C	TSSOP14	plastic thin shrink small outline package; 14 leads; body width 4.4 mm	SOT402-1

4. Functional diagram



5. Pinning information

5.1. Pinning



5.2. Pin description

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

6. Functional description

Table 3. Function table

H = HIGH voltage level; L = LOW voltage level; X = don't care; Z = high-impedance OFF-state.

Control	Input	Output
nOE	nA	nY
L	L	L
	H	H
H	X	Z

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	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)	-	±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	[2]	-	500	mW

- [1] The input and output voltage ratings may be exceeded if the input and output current ratings are observed.
[2] For SOT108-1 (SO14) package: P_{tot} derates linearly with 10.1 mW/K above 100 °C.
For SOT402-1 (TSSOP14) package: P_{tot} derates linearly with 7.3 mW/K above 81 °C.

8. Recommended operating conditions

Table 5. Recommended operating conditions

Voltages are referenced to GND (ground = 0 V)

Symbol	Parameter	Conditions	74HC125-Q100			74HCT125-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

9. Static characteristics

Table 6. Static characteristics

At recommended operating conditions; 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	
74HC125-Q100										
V _{IH}	HIGH-level input voltage	V _{CC} = 2.0 V	1.5	1.2	-	1.5	-	1.5	-	V
		V _{CC} = 4.5 V	3.15	2.4	-	3.15	-	3.15	-	V
		V _{CC} = 6.0 V	4.2	3.2	-	4.2	-	4.2	-	V
V _{IL}	LOW-level input voltage	V _{CC} = 2.0 V	-	0.8	0.5	-	0.5	-	0.5	V
		V _{CC} = 4.5 V	-	2.1	1.35	-	1.35	-	1.35	V
		V _{CC} = 6.0 V	-	2.8	1.8	-	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	-	1.9	-	V
		I _O = -20 µA; V _{CC} = 4.5 V	4.4	4.5	-	4.4	-	4.4	-	V
		I _O = -20 µA; V _{CC} = 6.0 V	5.9	6.0	-	5.9	-	5.9	-	V
		I _O = -6.0 mA; V _{CC} = 4.5 V	3.98	4.32	-	3.84	-	3.7	-	V
		I _O = -7.8 mA; V _{CC} = 6.0 V	5.48	5.81	-	5.34	-	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	-	0.1	V
		I _O = 20 µA; V _{CC} = 4.5 V	-	0	0.1	-	0.1	-	0.1	V
		I _O = 20 µA; V _{CC} = 6.0 V	-	0	0.1	-	0.1	-	0.1	V
		I _O = 6.0 mA; V _{CC} = 4.5 V	-	0.15	0.26	-	0.33	-	0.4	V
		I _O = 7.8 mA; V _{CC} = 6.0 V	-	0.16	0.26	-	0.33	-	0.4	V
I _I	input leakage current	V _I = V _{CC} or GND; V _{CC} = 6.0 V	-	-	±0.1	-	±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	-	-	±0.5	-	±5.0	-	±10.0	µA
I _{CC}	supply current	V _I = V _{CC} or GND; I _O = 0 A; V _{CC} = 6.0 V	-	-	8.0	-	80	-	160	µA
C _I	input capacitance		-	3.5	-	-	-	-	-	pF

Symbol	Parameter	Conditions	25 °C			-40 °C to +85 °C		-40 °C to +125 °C		Unit
			Min	Typ	Max	Min	Max	Min	Max	
74HCT125-Q100										
V _{IH}	HIGH-level input voltage	V _{CC} = 4.5 V to 5.5 V	2.0	1.6	-	2.0	-	2.0	-	V
V _{IL}	LOW-level input voltage	V _{CC} = 4.5 V to 5.5 V	-	1.2	0.8	-	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	-	4.4	-	V
		I _O = -6 mA	3.98	4.32	-	3.84	-	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	-	0.1	V
		I _O = 6.0 mA	-	0.16	0.26	-	0.33	-	0.4	V
I _I	input leakage current	V _I = V _{CC} or GND; V _{CC} = 5.5 V	-	-	±0.1	-	±1.0	-	±1.0	µA
I _{OZ}	OFF-state output current	V _I = V _{IH} or V _{IL} ; V _{CC} = 5.5 V; V _O = V _{CC} or GND	-	-	±0.5	-	±5.0	-	±10	µA
I _{CC}	supply current	V _I = V _{CC} or GND; I _O = 0 A; V _{CC} = 5.5 V	-	-	8.0	-	80	-	160	µA
ΔI _{CC}	additional supply current	per input pin; V _I = V _{CC} - 2.1 V; I _O = 0 A; other inputs at V _{CC} or GND; V _{CC} = 4.5 V to 5.5 V	-	100	360	-	450	-	490	µA
C _I	input capacitance		-	3.5	-	-	-	-	-	pF

10. Dynamic characteristics

Table 7. Dynamic characteristics

Voltages are referenced to GND (ground = 0 V); $C_L = 50$ pF unless otherwise specified; for test circuit see Fig. 6.

Symbol	Parameter	Conditions	25 °C			-40 °C to +85 °C		-40 °C to +125 °C		Unit
			Min	Typ	Max	Min	Max	Min	Max	
74HC125-Q100										
t _{pd}	propagation delay	nA to nY; see Fig. 4 [1]								
		V _{CC} = 2.0 V	-	30	100	-	125	-	150	ns
		V _{CC} = 4.5 V	-	11	20	-	25	-	30	ns
		V _{CC} = 5 V; C _L = 15 pF	-	9	-	-	-	-	-	ns
		V _{CC} = 6.0 V	-	9	17	-	21	-	26	ns
t _{en}	enable time	n $\overline{\text{OE}}$ to nY; see Fig. 5 [2]								
		V _{CC} = 2.0 V	-	41	125	-	155	-	190	ns
		V _{CC} = 4.5 V	-	15	25	-	31	-	38	ns
		V _{CC} = 6.0 V	-	12	21	-	26	-	32	ns
t _{dis}	disable time	n $\overline{\text{OE}}$ to nY; see Fig. 5 [3]								
		V _{CC} = 2.0 V	-	41	125	-	155	-	190	ns
		V _{CC} = 4.5 V	-	15	25	-	31	-	38	ns
		V _{CC} = 6.0 V	-	12	21	-	26	-	32	ns
t _t	transition time	nY; see Fig. 4 [4]								
		V _{CC} = 2.0 V	-	14	60	-	75	-	90	ns
		V _{CC} = 4.5 V	-	5	12	-	15	-	18	ns
		V _{CC} = 6.0 V	-	4	10	-	13	-	15	ns
C _{PD}	power dissipation capacitance	C _L = 50 pF; f = 1 MHz; V _I = GND to V _{CC} [5]	-	22	-	-	-	-	-	pF
74HCT125-Q100										
t _{pd}	propagation delay	nA to nY; see Fig. 4 [1]								
		V _{CC} = 4.5 V	-	15	25	-	31	-	38	ns
		V _{CC} = 5 V; C _L = 15 pF	-	12	-	-	-	-	-	ns
t _{en}	enable time	n $\overline{\text{OE}}$ to nY; see Fig. 5 [2]								
		V _{CC} = 4.5 V	-	15	28	-	35	-	42	ns
t _{dis}	disable time	n $\overline{\text{OE}}$ to nY; see Fig. 5 [3]								
		V _{CC} = 4.5 V	-	15	25	-	31	-	38	ns
t _t	transition time	nY; see Fig. 4 [4]	-	5	12	-	15	-	18	ns
C _{PD}	power dissipation capacitance	C _L = 50 pF; f = 1 MHz; V _I = GND to V _{CC} - 1.5 V [5]	-	24	-	-	-	-	-	pF

[1] t_{pd} is the same as t_{PLH} and t_{PHL} .

[2] t_{en} is the same as t_{PZH} and t_{PZL} .

[3] t_{dis} is the same as t_{PLZ} and t_{PHZ} .

[4] t_t is the same as t_{THL} and t_{TLH} .

[5] C_{PD} is used to determine the dynamic power dissipation (P_D in μW). $P_D = C_{PD} \times V_{CC}^2 \times f_i \times N + \sum (C_L \times V_{CC}^2 \times f_o)$ 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 V;

N = number of inputs switching;

$\sum (C_L \times V_{CC}^2 \times f_o)$ = sum of outputs.

10.1. Waveforms and test circuit

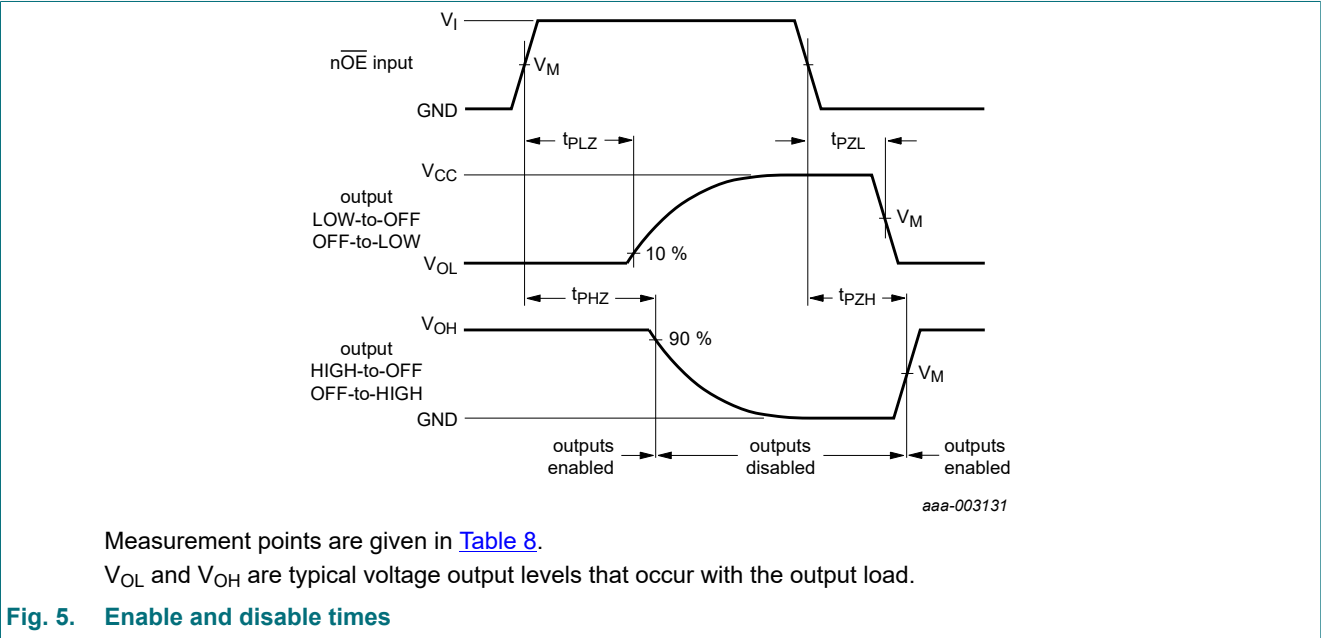
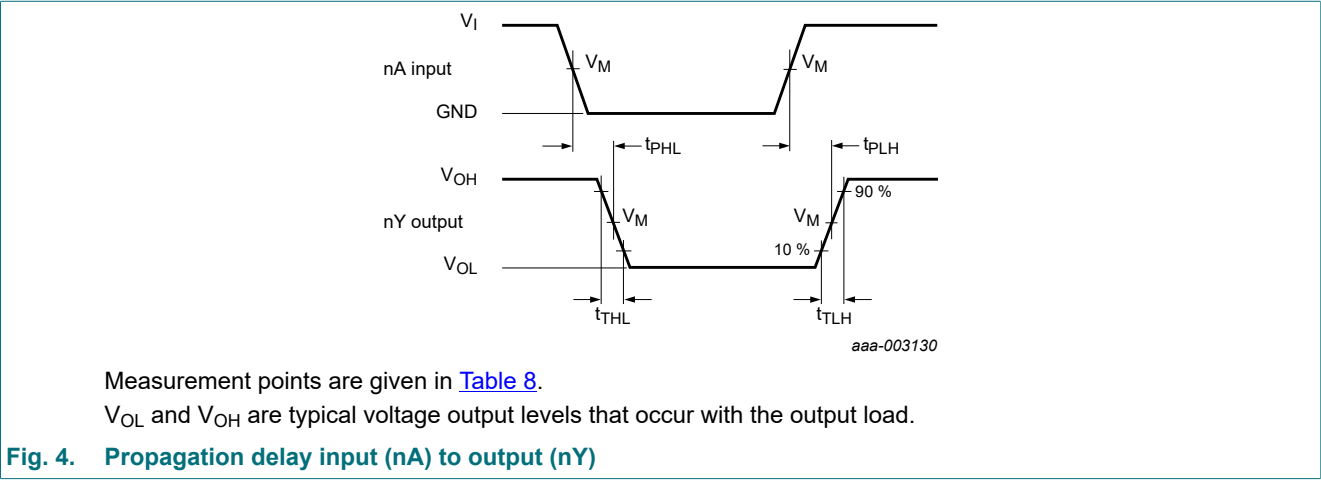


Table 8. Measurement points

Type	Input	Output
	V_M	V_M
74HC125-Q100	$0.5 \times V_{CC}$	$0.5 \times V_{CC}$
74HCT125-Q100	1.3 V	1.3 V

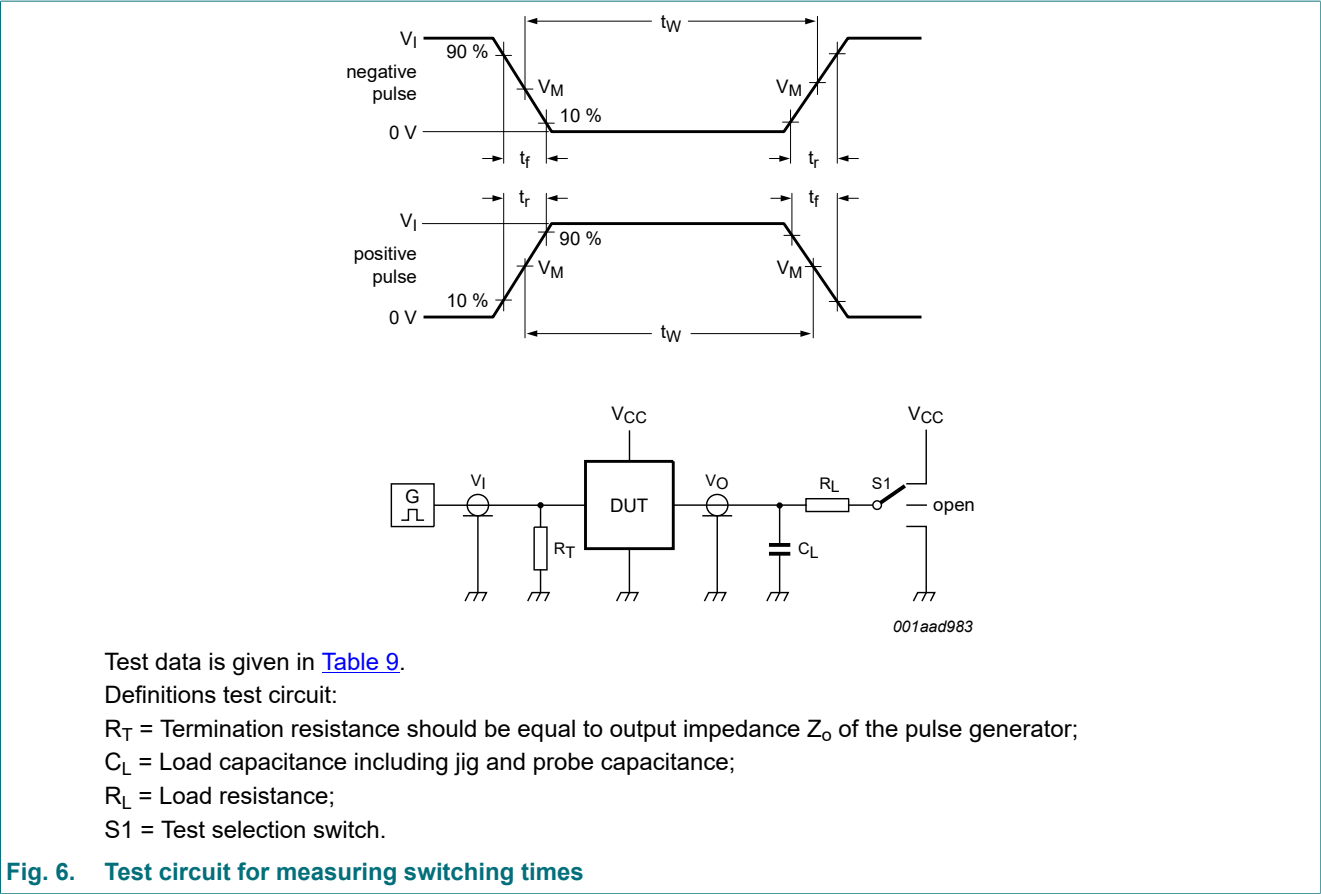


Fig. 6. Test circuit for measuring switching times

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}
74HC125-Q100	V_{CC}	6 ns	15 pF, 50 pF	1 kΩ	open	GND	V_{CC}
74HCT125-Q100	3 V	6 ns	15 pF, 50 pF	1 kΩ	open	GND	V_{CC}

11. Package outline

SO14: plastic small outline package; 14 leads; body width 3.9 mm

SOT108-1



Fig. 7. Package outline SOT108-1 (SO14)

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

SOT402-1

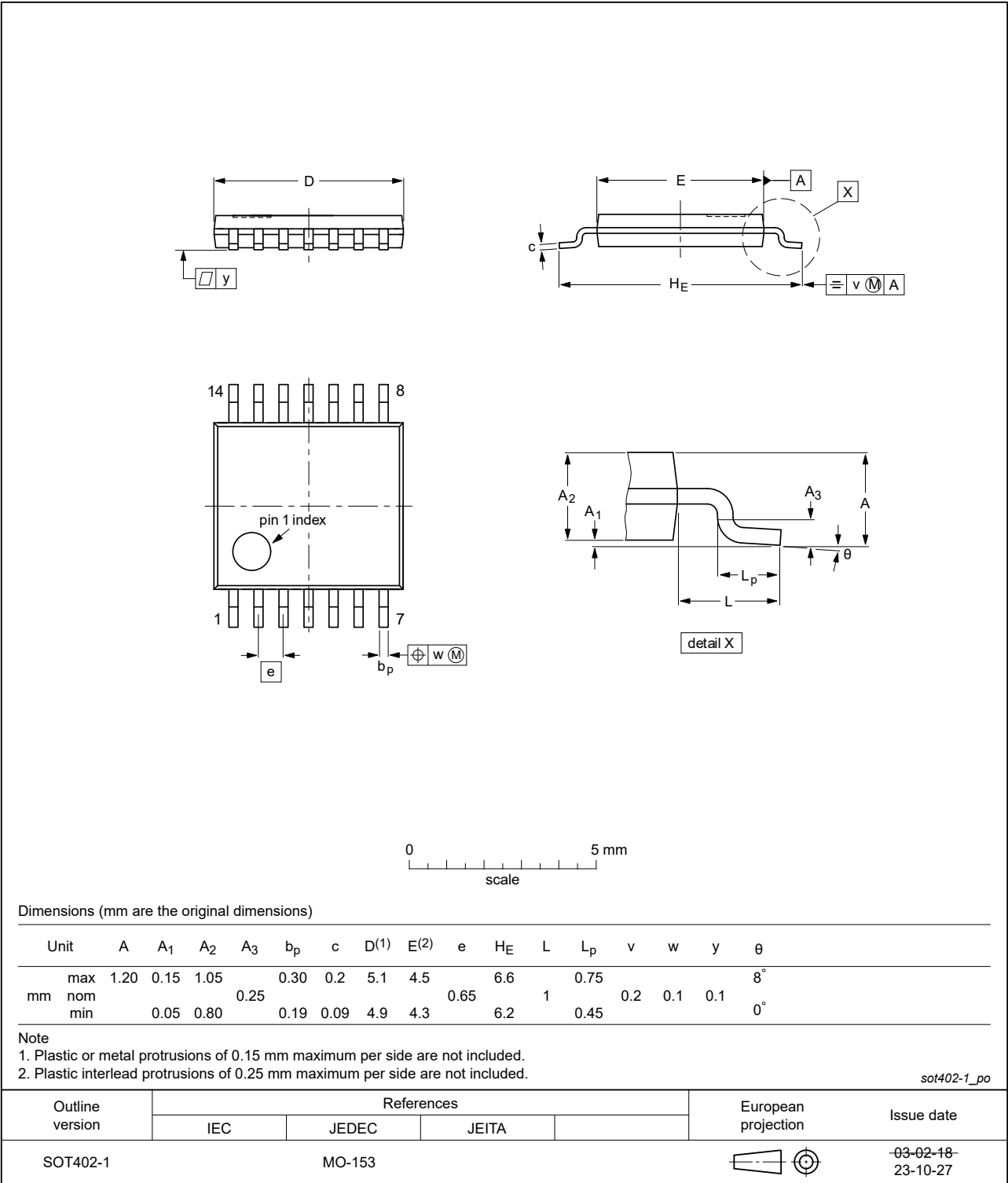


Fig. 8. Package outline SOT402-1 (TSSOP14)

12. Abbreviations

Table 10. Abbreviations

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

13. Revision history

Table 11. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
74HC_HCT125_Q100 v.4	20240222	Product data sheet	-	74HC_HCT125_Q100 v.3
Modifications:	<ul style="list-style-type: none">Section 2: ESD specification updated according to the latest JEDEC standard.Fig. 7, Fig. 8: Aligned SO and TSSOP package outline drawings to JEDEC MS-012 and MO-153			
74HC_HCT125_Q100 v.3	20210204	Product data sheet	-	74HC_HCT125_Q100 v.2
Modifications:	<ul style="list-style-type: none">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 2 updated.Section 7: Derating values for P_{tot} total power dissipation updated.			
74HC_HCT125_Q100 v.2	20150119	Product data sheet	-	74HC_HCT125_Q100 v.1
Modifications:	<ul style="list-style-type: none">Table 7: Power dissipation capacitance condition for 74HCT125-Q100 is corrected.			
74HC_HCT125_Q100 v.1	20130226	Product data sheet	-	-

14. 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.
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- [2] The term 'short data sheet' is explained in section "Definitions".
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