

# 74ALVC125

Quad buffer/line driver; 3-state

Rev. 5 — 7 July 2023

Product data sheet

## 1. General description

The 74ALVC125 is a quad non-inverting buffer/line driver with 3-state outputs. The 3-state outputs (nY) are controlled by the output enable input (nOE). A HIGH on the nOE pin causes the outputs to assume a high-impedance OFF-state.

Schmitt trigger action on all inputs makes the device tolerant of slow rise and fall times.

This device is fully specified for partial power down applications using I<sub>OFF</sub>. The I<sub>OFF</sub> circuitry disables the output, preventing the potentially damaging backflow current through the device when it is powered down.

## 2. Features and benefits

- Wide supply voltage range from 1.65 V to 3.6 V
- CMOS low power dissipation
- Overvoltage tolerant inputs to 3.6 V
- Direct interface with TTL levels
- I<sub>OFF</sub> circuitry provides partial Power-down mode operation
- Latch-up performance exceeds 250 mA per JESD78 Class II.A
- Complies with JEDEC standards:
  - JESD8-7 (1.65 V to 1.95 V)
  - JESD8-5 (2.3 V to 2.7 V)
  - JESD8C/JESD36 (2.7 V to 3.6 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
- Multiple package options
- Specified from -40 °C to +85 °C and from -40 °C to +125 °C

## 3. Ordering information

Table 1. Ordering information

Type number	Package			Version
	Temperature range	Name	Description	
<a href="#">74ALVC125D</a>	-40 °C to +125 °C	SO14	plastic small outline package; 14 leads; body width 3.9 mm	<a href="#">SOT108-1</a>
<a href="#">74ALVC125PW</a>	-40 °C to +125 °C	TSSOP14	plastic thin shrink small outline package; 14 leads; body width 4.4 mm	<a href="#">SOT402-1</a>
<a href="#">74ALVC125BQ</a>	-40 °C to +125 °C	DHVQFN14	plastic dual in-line compatible thermal enhanced very thin quad flat package; no leads; 14 terminals; body 2.5 × 3 × 0.85 mm	<a href="#">SOT762-1</a>

### 4. Functional diagram

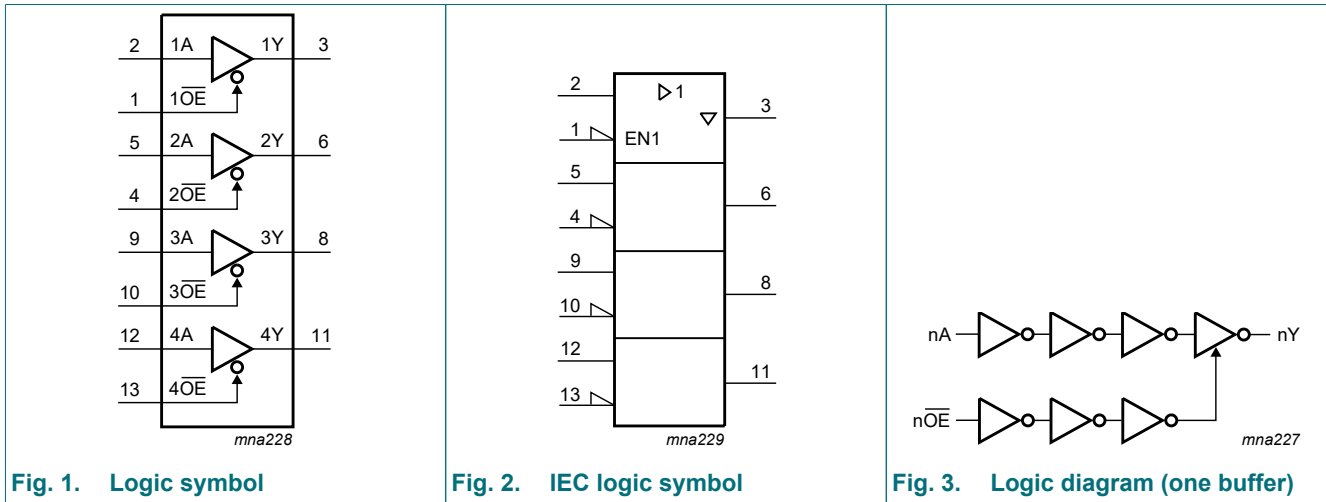


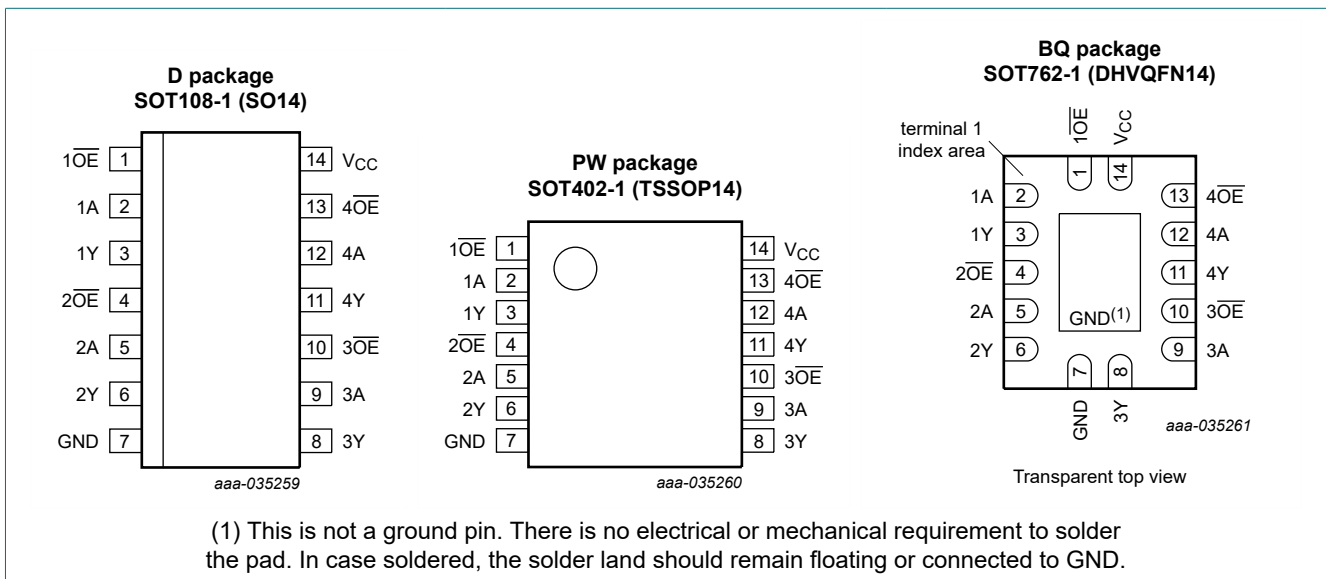
Fig. 1. Logic symbol

Fig. 2. IEC logic symbol

Fig. 3. Logic diagram (one buffer)

### 5. Pinning information

#### 5.1. Pinning



#### 5.2. Pin description

Table 2. Pin description

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

## 6. Functional description

**Table 3. Function table**

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

Input		Output
nOE	nA	nY
L	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	+4.6	V
$V_I$	input voltage		[1] -0.5	+4.6	V
$V_O$	output voltage	output HIGH or LOW state	[1] -0.5	$V_{CC} + 0.5$	V
		output 3-state	-0.5	+4.6	V
		Power-down mode; $V_{CC} = 0$ V	-0.5	+4.6	V
$I_{IK}$	input clamping current	$V_I < 0$ V	-50	-	mA
$I_{OK}$	output clamping current	$V_O > V_{CC}$ or $V_O < 0$ V	-	$\pm 50$	mA
$I_O$	output current	$V_O = 0$ V to $V_{CC}$	-	$\pm 50$	mA
$I_{CC}$	supply current		-	100	mA
$I_{GND}$	ground current		-100	-	mA
$T_{stg}$	storage temperature		-65	+150	°C
$P_{tot}$	total power dissipation	$T_{amb} = -40$ °C to +125 °C	[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.

For SOT762-1 (DHVQFN14) package:  $P_{tot}$  derates linearly with 9.6 mW/K above 98 °C.

## 8. Recommended operating conditions

**Table 5. Recommended operating conditions**

Symbol	Parameter	Conditions	Min	Max	Unit
$V_{CC}$	supply voltage		1.65	3.6	V
$V_I$	input voltage		0	3.6	V
$V_O$	output voltage	output HIGH or LOW state	0	$V_{CC}$	V
		output 3-state	0	3.6	V
		Power-down mode; $V_{CC} = 0$ V	0	3.6	V
$T_{amb}$	ambient temperature	in free air	-40	+125	°C
$\Delta t/\Delta V$	input transition rise and fall rate	$V_{CC} = 1.65$ V to 2.7 V	0	20	ns/V
		$V_{CC} = 2.7$ V to 3.6 V	0	10	ns/V

## 9. Static characteristics

**Table 6. Static characteristics**

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 <sub>IH</sub>	HIGH-level input voltage	V <sub>CC</sub> = 1.65 V to 1.95 V	0.65 × V <sub>CC</sub>	-	-	0.65 × V <sub>CC</sub>	-	V
		V <sub>CC</sub> = 2.3 V to 2.7 V	1.7	-	-	1.7	-	V
		V <sub>CC</sub> = 2.7 V to 3.6 V	2.0	-	-	2.0	-	V
V <sub>IL</sub>	LOW-level input voltage	V <sub>CC</sub> = 1.65 V to 1.95 V	-	-	0.35 × V <sub>CC</sub>	-	0.35 × V <sub>CC</sub>	V
		V <sub>CC</sub> = 2.3 V to 2.7 V	-	-	0.7	-	0.7	V
		V <sub>CC</sub> = 2.7 V to 3.6 V	-	-	0.8	-	0.8	V
V <sub>OH</sub>	HIGH-level output voltage	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>						
		I <sub>O</sub> = -100 μA; V <sub>CC</sub> = 1.65 V to 3.6 V	V <sub>CC</sub> - 0.2	-	-	V <sub>CC</sub> - 0.2	-	V
		I <sub>O</sub> = -6 mA; V <sub>CC</sub> = 1.65 V	1.25	1.51	-	1.25	-	V
		I <sub>O</sub> = -12 mA; V <sub>CC</sub> = 2.3 V	1.8	2.10	-	1.8	-	V
		I <sub>O</sub> = -18 mA; V <sub>CC</sub> = 2.3 V	1.7	2.01	-	1.7	-	V
		I <sub>O</sub> = -12 mA; V <sub>CC</sub> = 2.7 V	2.2	2.53	-	2.2	-	V
		I <sub>O</sub> = -18 mA; V <sub>CC</sub> = 3.0 V	2.4	2.76	-	2.4	-	V
		I <sub>O</sub> = -24 mA; V <sub>CC</sub> = 3.0 V	2.2	2.68	-	2.2	-	V
V <sub>OL</sub>	LOW-level output voltage	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>						
		I <sub>O</sub> = 100 μA; V <sub>CC</sub> = 1.65 V to 3.6 V	-	-	0.2	-	0.2	V
		I <sub>O</sub> = 6 mA; V <sub>CC</sub> = 1.65 V	-	0.11	0.3	-	0.3	V
		I <sub>O</sub> = 12 mA; V <sub>CC</sub> = 2.3 V	-	0.17	0.4	-	0.4	V
		I <sub>O</sub> = 18 mA; V <sub>CC</sub> = 2.3 V	-	0.25	0.6	-	0.6	V
		I <sub>O</sub> = 12 mA; V <sub>CC</sub> = 2.7 V	-	0.16	0.4	-	0.4	V
		I <sub>O</sub> = 18 mA; V <sub>CC</sub> = 3.0 V	-	0.23	0.4	-	0.45	V
		I <sub>O</sub> = 24 mA; V <sub>CC</sub> = 3.0 V	-	0.30	0.55	-	0.55	V
I <sub>I</sub>	input leakage current	V <sub>CC</sub> = 3.6 V; V <sub>I</sub> = 3.6 V or GND	-	±0.1	±5	-	±20	μA
I <sub>OZ</sub>	OFF-state output current	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; V <sub>CC</sub> = 1.65 V to 3.6 V; V <sub>O</sub> = 3.6 V or GND	-	±0.1	±10	-	±80	μA
I <sub>OFF</sub>	power-off leakage current	V <sub>CC</sub> = 0 V; V <sub>I</sub> or V <sub>O</sub> = 0 V to 3.6 V	-	±0.1	±10	-	±80	μA
I <sub>CC</sub>	supply current	V <sub>CC</sub> = 3.6 V; V <sub>I</sub> = V <sub>CC</sub> or GND; I <sub>O</sub> = 0 A	-	0.2	10	-	80	μA
ΔI <sub>CC</sub>	additional supply current	per input pin; V <sub>CC</sub> = 3.0 V to 3.6 V; V <sub>I</sub> = V <sub>CC</sub> - 0.6 V; I <sub>O</sub> = 0 A	-	5	750	-	750	μA
C <sub>I</sub>	input capacitance		-	3.5	-	-	-	pF

[1] All typical values are measured at V<sub>CC</sub> = 3.3 V (unless stated otherwise) and T<sub>amb</sub> = 25 °C.

## 10. Dynamic characteristics

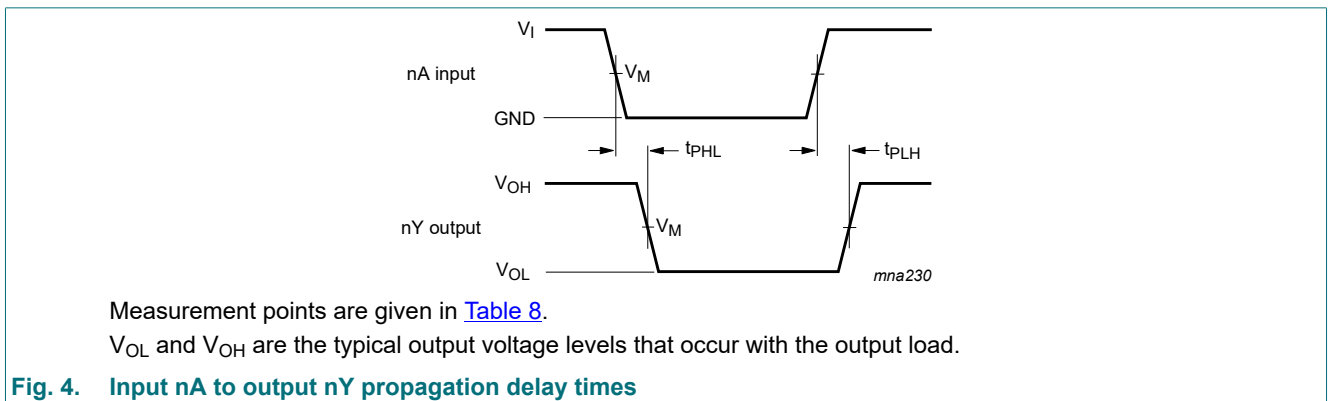
**Table 7. Dynamic characteristics**

Voltages are referenced to GND (ground = 0 V). For test circuit see Fig. 6.

Symbol	Parameter	Conditions	-40 °C to +85 °C			-40 °C to +125 °C		Unit
			Min	Typ[1]	Max	Min	Max	
t <sub>pd</sub>	propagation delay	nA to nY; see Fig. 4 [2]						
		V <sub>CC</sub> = 1.65 V to 1.95 V	1.3	2.4	5.3	1.3	6.1	ns
		V <sub>CC</sub> = 2.3 V to 2.7 V	1.0	1.7	3.2	1.0	3.7	ns
		V <sub>CC</sub> = 2.7 V	1.0	2.0	3.1	1.0	3.6	ns
t <sub>en</sub>	enable time	nOE to nY; see Fig. 5 [2]						
		V <sub>CC</sub> = 1.65 V to 1.95 V	1.4	3.9	6.4	1.4	7.4	ns
		V <sub>CC</sub> = 2.3 V to 2.7 V	1.0	2.2	4.1	1.0	4.7	ns
		V <sub>CC</sub> = 2.7 V	1.0	2.7	4.3	1.0	4.9	ns
t <sub>dis</sub>	disable time	nOE to nY; see Fig. 5 [2]						
		V <sub>CC</sub> = 1.65 V to 1.95 V	1.8	3.9	5.9	1.8	6.8	ns
		V <sub>CC</sub> = 2.3 V to 2.7 V	1.0	2.1	3.4	1.0	3.9	ns
		V <sub>CC</sub> = 2.7 V	1.0	2.9	4.0	1.0	4.6	ns
C <sub>PD</sub>	power dissipation capacitance	per buffer; V <sub>I</sub> = GND to V <sub>CC</sub> ; V <sub>CC</sub> = 3.3 V [3]						
		outputs HIGH or LOW state	-	27	-	-	-	pF
		outputs 3-state	-	5	-	-	-	pF

- [1] Typical values are measured at T<sub>amb</sub> = 25 °C
- [2] t<sub>pd</sub> is the same as t<sub>PHL</sub> and t<sub>PLH</sub>.  
t<sub>en</sub> is the same as t<sub>PZH</sub> and t<sub>PZL</sub>.  
t<sub>dis</sub> is the same as t<sub>PHZ</sub> and t<sub>PLZ</sub>.
- [3] C<sub>PD</sub> is used to determine the dynamic power dissipation (P<sub>D</sub> in μW).  
P<sub>D</sub> = C<sub>PD</sub> × V<sub>CC</sub><sup>2</sup> × f<sub>i</sub> × N + Σ(C<sub>L</sub> × V<sub>CC</sub><sup>2</sup> × f<sub>o</sub>) where:  
f<sub>i</sub> = input frequency in MHz; f<sub>o</sub> = output frequency in MHz;  
C<sub>L</sub> = output load capacitance in pF; V<sub>CC</sub> = supply voltage in V;  
N = number of inputs switching; Σ(C<sub>L</sub> × V<sub>CC</sub><sup>2</sup> × f<sub>o</sub>) = sum of the outputs.

### 10.1. Waveforms and test circuit



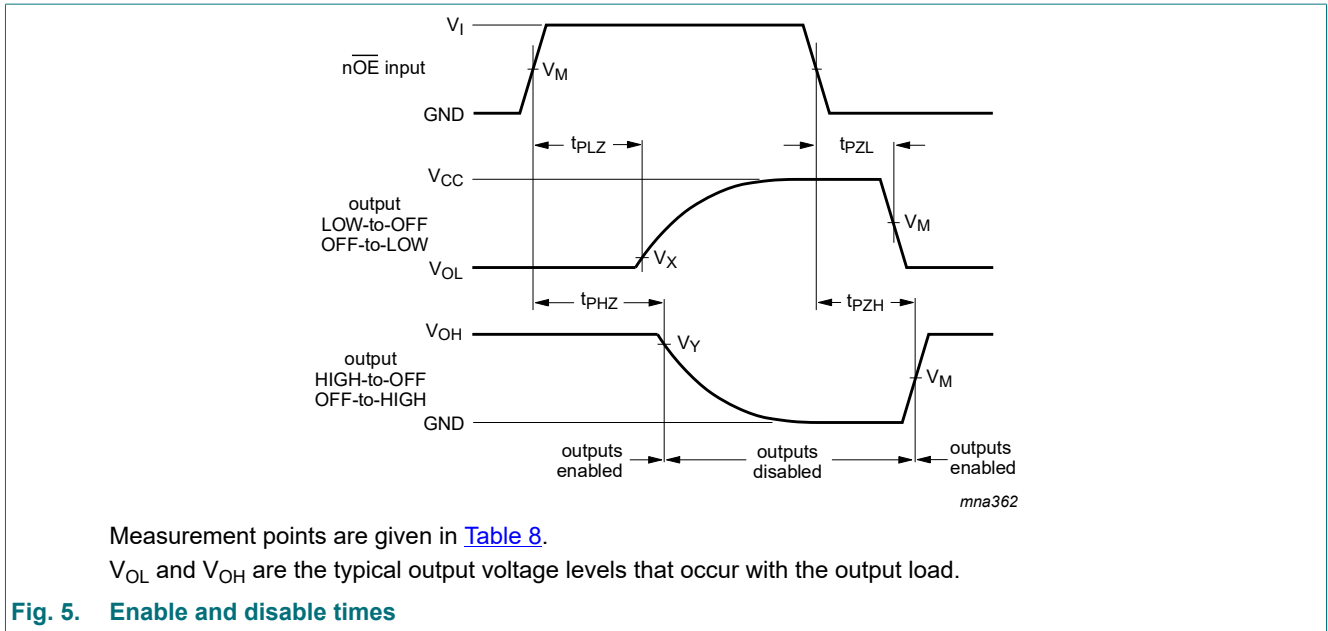


Table 8. Measurement points

Supply voltage	Input	Output		
$V_{CC}$	$V_M$	$V_M$	$V_X$	$V_Y$
1.65 V to 1.95 V	$0.5 \times V_{CC}$	$0.5 \times V_{CC}$	$V_{OL} + 0.15 \text{ V}$	$V_{OH} - 0.15 \text{ V}$
2.3 V to 2.7 V	$0.5 \times V_{CC}$	$0.5 \times V_{CC}$	$V_{OL} + 0.15 \text{ V}$	$V_{OH} - 0.15 \text{ V}$
2.7 V	1.5 V	1.5 V	$V_{OL} + 0.3 \text{ V}$	$V_{OH} - 0.3 \text{ V}$
3.0 V to 3.6 V	1.5 V	1.5 V	$V_{OL} + 0.3 \text{ V}$	$V_{OH} - 0.3 \text{ V}$

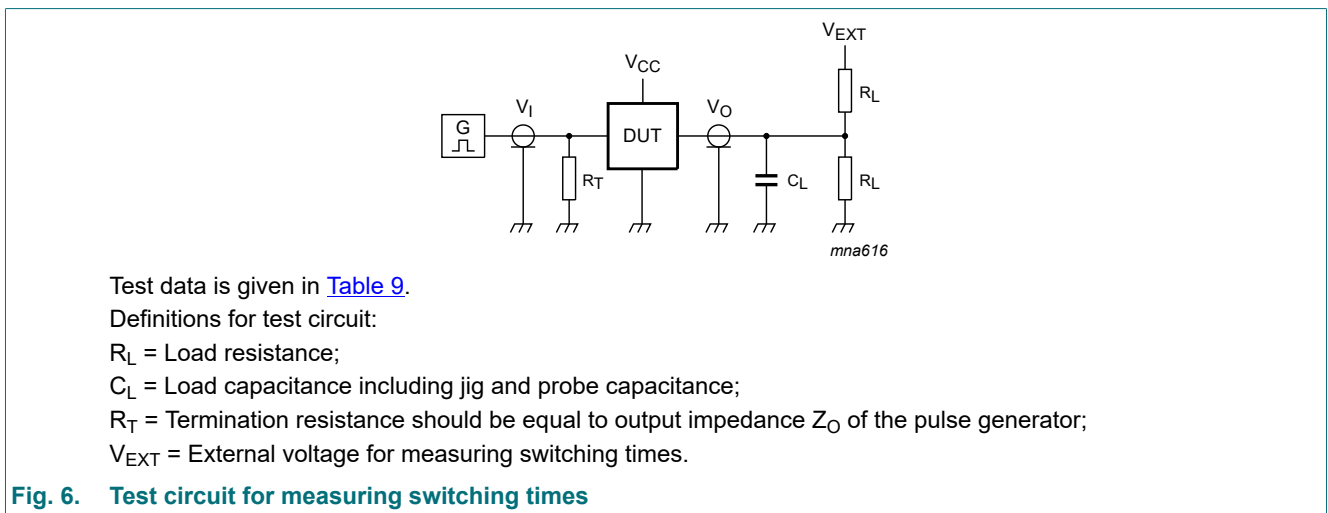


Table 9. Test data

Supply voltage	Input		Load		$V_{EXT}$		
	$V_I$	$t_r, t_f$	$C_L$	$R_L$	$t_{PLH}, t_{PHL}$	$t_{PLZ}, t_{PZL}$	$t_{PHZ}, t_{PZH}$
1.65 V to 1.95 V	$V_{CC}$	$\leq 2.0 \text{ ns}$	30 pF	1 k $\Omega$	open	$2 \times V_{CC}$	GND
2.3 V to 2.7 V	$V_{CC}$	$\leq 2.0 \text{ ns}$	30 pF	500 $\Omega$	open	$2 \times V_{CC}$	GND
2.7 V	2.7 V	$\leq 2.5 \text{ ns}$	50 pF	500 $\Omega$	open	6 V	GND
3.0 V to 3.6 V	2.7 V	$\leq 2.5 \text{ ns}$	50 pF	500 $\Omega$	open	6 V	GND

### 11. Package outline

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

SOT108-1

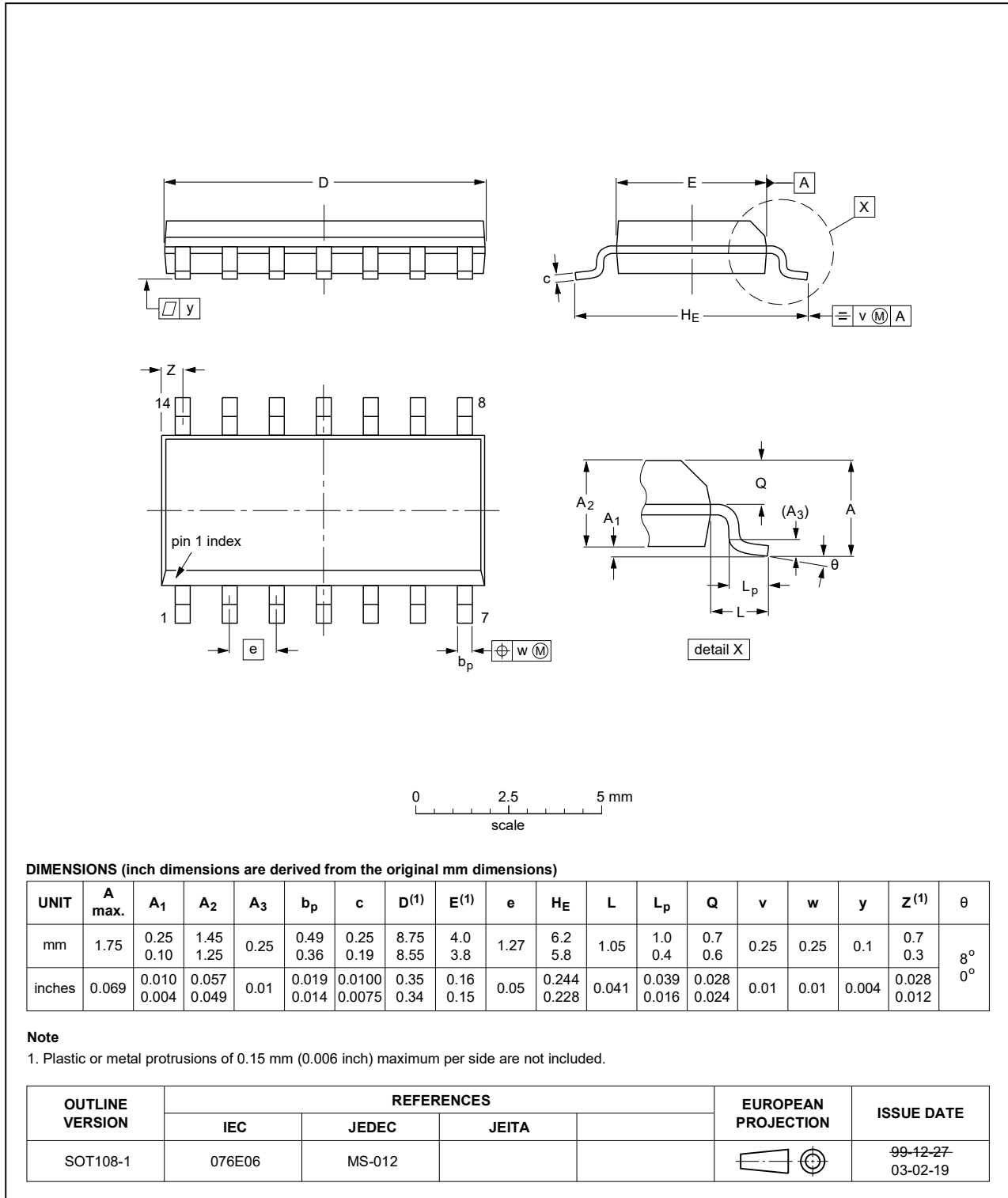


Fig. 7. Package outline SOT108-1 (SO14)

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

SOT402-1

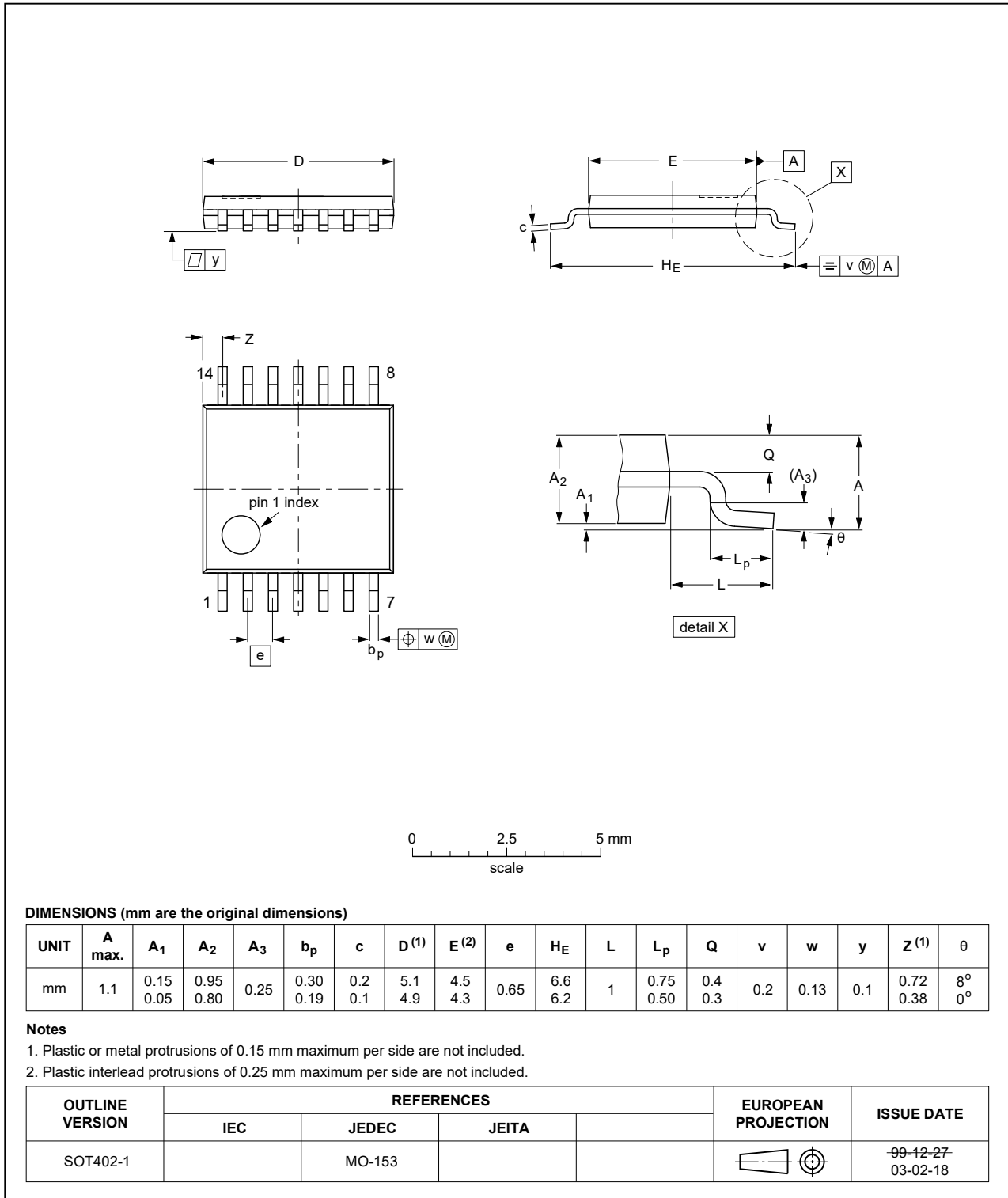


Fig. 8. Package outline SOT402-1 (TSSOP14)



DHVQFN14: plastic dual in-line compatible thermal enhanced very thin quad flat package; no leads; 14 terminals; body 2.5 x 3 x 0.85 mm

SOT762-1

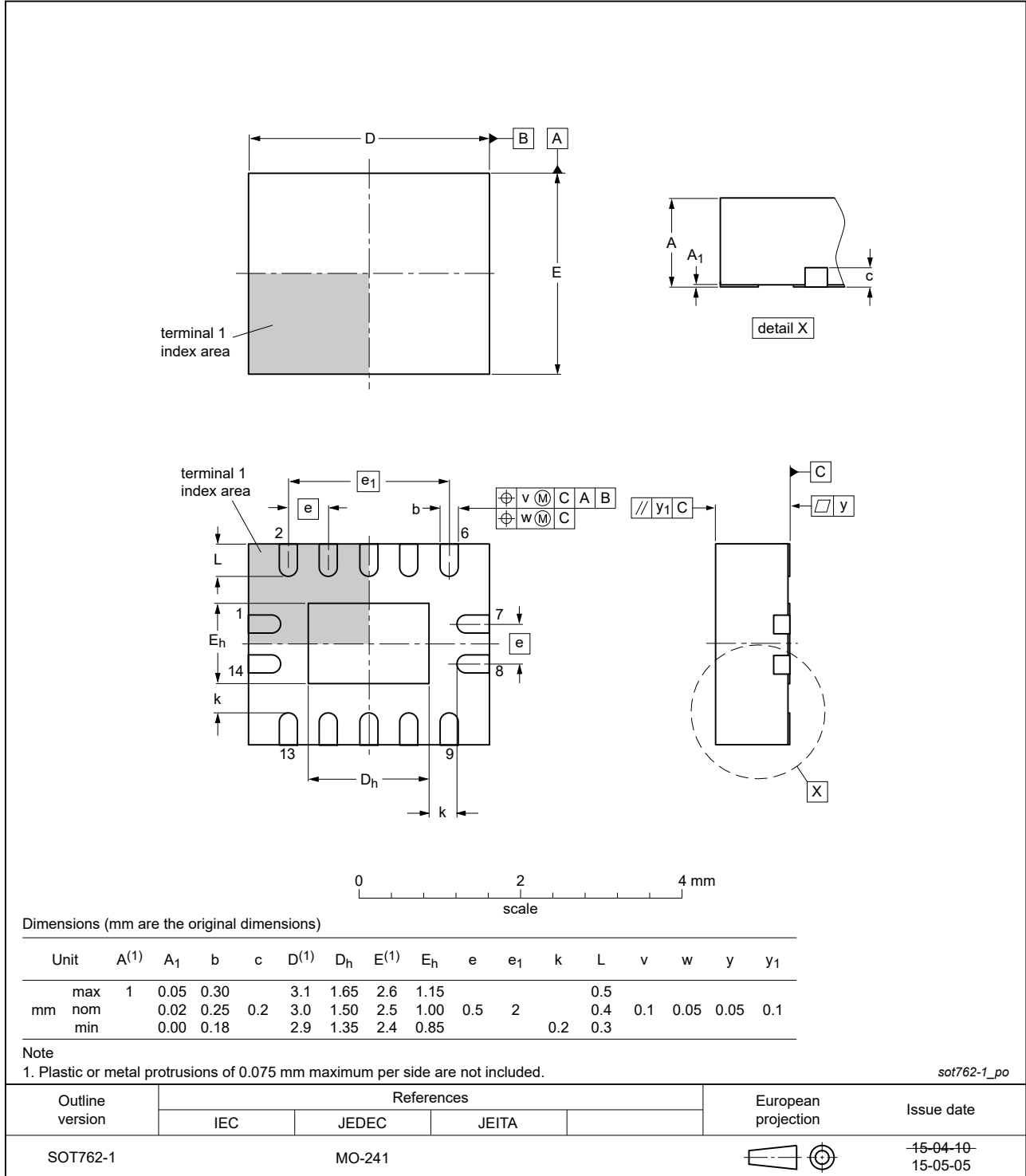


Fig. 9. Package outline SOT762-1 (DHVQFN14)

## 12. Abbreviations

Table 10. Abbreviations

Acronym	Description
CDM	Charged Device Model
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
74ALVC125 v.5	20230707	Product data sheet	-	74ALVC125 v.4
Modifications:	<ul style="list-style-type: none"> <li>Specifications added for <math>T_{amb} = -40\text{ °C}</math> to <math>+125\text{ °C}</math>.</li> <li><a href="#">Section 1</a> updated.</li> <li><a href="#">Section 2</a>: updated; ESD specification updated according to the latest JEDEC standard.</li> </ul>			
74ALVC125 v.4	20210430	Product data sheet	-	74ALVC125 v.3
Modifications:	<ul style="list-style-type: none"> <li><a href="#">Section 2</a>: Reference to JESD36 removed.</li> <li><a href="#">Table 4</a>: Derating values for <math>P_{tot}</math> total power dissipation updated (errata).</li> </ul>			
74ALVC125 v.3	20200924	Product data sheet	-	74ALVC125 v.2
Modifications:	<ul style="list-style-type: none"> <li>The format of this data sheet has been redesigned to comply with the identity guidelines of Nexperia.</li> <li>Legal texts have been adapted to the new company name where appropriate.</li> <li><a href="#">Table 4</a>: Derating values for <math>P_{tot}</math> total power dissipation have been updated.</li> <li>Package outline drawing of SOT762-1 (<a href="#">Fig. 9</a>) updated.</li> </ul>			
74ALVC125 v.2	20080110	Product data sheet	-	74ALVC125 v.1
Modifications:	<ul style="list-style-type: none"> <li>The format of this data sheet has been redesigned to comply with the new identity guidelines of NXP Semiconductors.</li> <li>Legal texts have been adapted to the new company name where appropriate.</li> <li><a href="#">Section 3</a>: DHVQFN14 package added.</li> <li><a href="#">Section 7</a>: derating values added for DHVQFN14 package.</li> <li><a href="#">Section 11</a>: outline drawing added for DHVQFN14 package.</li> </ul>			
74ALVC125 v.1	20021118	Product specification	-	-

## 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.
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".
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For sales office addresses, please send an email to: [salesaddresses@nexperia.com](mailto:salesaddresses@nexperia.com)  
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