

74LV132PW-Q100J Datasheet

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DiGi Electronics Part Number	74LV132PW-Q100J-DG
Manufacturer	Nexperia USA Inc.
Manufacturer Product Number	74LV132PW-Q100J
Description	IC GATE NAND 4CH 2-INP 14TSSOP
Detailed Description	NAND Gate IC 4 Channel Schmitt Trigger 14-TSSOP



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Purchase and inquiry

Manufacturer Product Number:

74LV132PW-Q100J

Series:

74LV

Logic Type:

NAND Gate

Number of Inputs:

2

Voltage - Supply:

1V ~ 5.5V

Current - Output High, Low:

12mA, 12mA

Input Logic Level - High:

1.4V ~ 3.9V

Operating Temperature:

-40°C ~ 125°C

Qualification:

AEC-Q100

Supplier Device Package:

14-TSSOP

Base Product Number:

74LV132

Manufacturer:

Nexperia USA Inc.

Product Status:

Active

Number of Circuits:

4

Features:

Schmitt Trigger

Current - Quiescent (Max):20 μ A**Input Logic Level - Low:**

0.3V ~ 1.2V

Max Propagation Delay @ V, Max CL:

9ns @ 5V, 50pF

Grade:

Automotive

Mounting Type:

Surface Mount

Package / Case:

14-TSSOP (0.173", 4.40mm Width)

Environmental & Export classification

RoHS Status:

ROHS3 Compliant

REACH Status:

REACH Unaffected

HTSUS:

8542.39.0001

Moisture Sensitivity Level (MSL):

1 (Unlimited)

ECCN:

EAR99



74LV132-Q100

Quad 2-input NAND Schmitt trigger

Rev. 3 — 30 January 2024

Product data sheet

1. General description

The 74LV132-Q100 is a low-voltage Si-gate CMOS device that is pin and function compatible with 74HC132-Q100 and 74HCT132-Q100.

The 74LV132-Q100 contains four 2-input NAND gates which accept standard input signals. These gates are capable of transforming slowly changing input signals into sharply defined, jitter-free output signals.

The gate switches at different points for positive and negative-going signals. The difference between the positive voltage V_{T+} and the negative voltage V_{T-} is defined as the input hysteresis voltage V_H .

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 operating voltage: 1.0 V to 5.5 V
- Optimized for low voltage applications: 1.0 V to 3.6 V
- Accepts TTL input levels between $V_{CC} = 2.7$ V and $V_{CC} = 3.6$ V
- Typical output ground bounce < 0.8 V at $V_{CC} = 3.3$ V and $T_{amb} = 25$ °C
- Typical HIGH-level output voltage (V_{OH}) undershoot: > 2 V at $V_{CC} = 3.3$ V and $T_{amb} = 25$ °C
- 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
- DHVQFN package with Side-Wettable Flanks enabling Automatic Optical Inspection (AOI) of solder joints

3. Applications

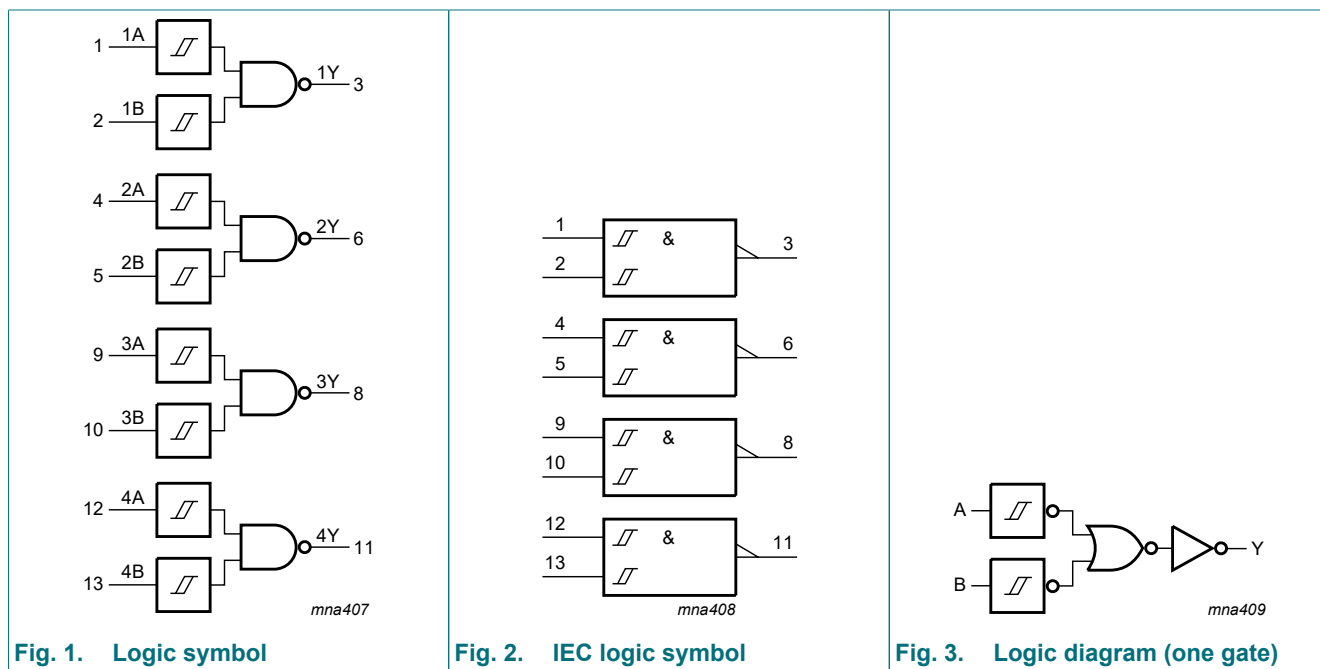
- Wave and pulse shapers for highly noisy environments
- Astable multivibrators
- Monostable multivibrators

4. Ordering information

Table 1. Ordering information

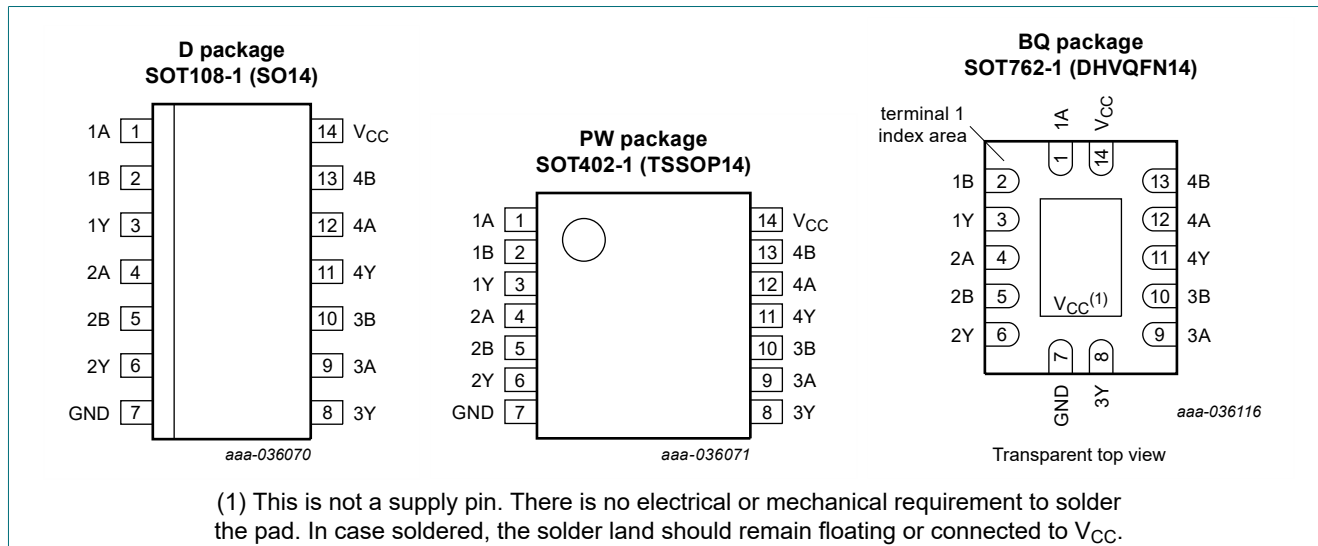
Type number	Package			Version
	Temperature range	Name	Description	
74LV132D-Q100	-40 °C to +125 °C	SO14	plastic small outline package; 14 leads; body width 3.9 mm	SOT108-1
74LV132PW-Q100	-40 °C to +125 °C	TSSOP14	plastic thin shrink small outline package; 14 leads; body width 4.4 mm	SOT402-1
74LV132BQ-Q100	-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	SOT762-1

5. Functional diagram



6. Pinning information

6.1. Pinning



6.2. Pin description

Table 2. Pin description

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

7. Functional description

Table 3. 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 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	+7.0	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]	-	± 50	mA
I_O	output current	$V_O = -0.5\text{ V}$ to $(V_{CC} + 0.5\text{ V})$	-	± 25	mA
I_{CC}	supply current		-	50	mA
I_{GND}	ground current		-50	-	mA
T_{stg}	storage temperature		-65	+150	°C
P_{tot}	total power dissipation	$T_{amb} = -40\text{ °C}$ to $+125\text{ °C}$ [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.

9. Recommended operating conditions

Table 5. Recommended operating conditions

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

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{CC}	supply voltage	[1]	1.0	3.3	5.5	V
V_I	input voltage		0	-	V_{CC}	V
V_O	output voltage		0	-	V_{CC}	V
T_{amb}	ambient temperature		-40	+25	+125	°C

[1] The static characteristics are guaranteed from $V_{CC} = 1.2\text{ V}$ to $V_{CC} = 5.5\text{ V}$, but LV devices are guaranteed to function down to $V_{CC} = 1.0\text{ V}$ (with input levels GND or V_{CC}).

10. Static characteristics

Table 6. Static characteristics

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 _{OH}	HIGH-level output voltage	V _I = V _{T+} or V _{T-}						
		I _O = -100 μA; V _{CC} = 1.2 V	-	1.2	-	-	-	V
		I _O = -100 μA; V _{CC} = 2.0 V	1.8	2.0	-	1.8	-	V
		I _O = -100 μA; V _{CC} = 2.7 V	2.5	2.7	-	2.5	-	V
		I _O = -100 μA; V _{CC} = 3.0 V	2.8	3.0	-	2.8	-	V
		I _O = -100 μA; V _{CC} = 4.5 V	4.3	4.5	-	4.3	-	V
		I _O = -6 mA; V _{CC} = 3.0 V	2.4	2.82	-	2.2	-	V
I _O = -12 mA; V _{CC} = 4.5 V	3.6	4.2	-	3.5	-	V		
V _{OL}	LOW-level output voltage	V _I = V _{T+} or V _{T-}						
		I _O = 100 μA; V _{CC} = 1.2 V	-	0	-	-	-	V
		I _O = 100 μA; V _{CC} = 2.0 V	-	0	0.2	-	0.2	V
		I _O = 100 μA; V _{CC} = 2.7 V	-	0	0.2	-	0.2	V
		I _O = 100 μA; V _{CC} = 3.0 V	-	0	0.2	-	0.2	V
		I _O = 100 μA; V _{CC} = 4.5 V	-	0	0.2	-	0.2	V
		I _O = 6 mA; V _{CC} = 3.0 V	-	0.25	0.40	-	0.50	V
I _O = 12 mA; V _{CC} = 4.5 V	-	0.35	0.55	-	0.65	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	-	-	20.0	-	40	μA
ΔI _{CC}	additional supply current	per input; V _I = V _{CC} - 0.6 V; V _{CC} = 2.7 V to 3.6 V	-	-	500	-	850	μA
C _I	input capacitance		-	3.5	-	-	-	pF

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

11. Dynamic characteristics

Table 7. Dynamic characteristics

$GND = 0\text{ V}$; For test circuit see Fig. 5.

Symbol	Parameter	Conditions	-40 °C to +85 °C			-40 °C to +125 °C		Unit
			Min	Typ [1]	Max	Min	Max	
t_{pd}	propagation delay	nA, nB to nY; see Fig. 4 [2]						
		$V_{CC} = 1.2\text{ V}$	-	65	-	-	-	ns
		$V_{CC} = 2.0\text{ V}$	-	18	34	-	43	ns
		$V_{CC} = 2.7\text{ V}$	-	15	24	-	30	ns
		$V_{CC} = 3.0\text{ V to }3.6\text{ V}$; $C_L = 15\text{ pF}$ [3]	-	10	-	-	-	ns
		$V_{CC} = 3.0\text{ V to }3.6\text{ V}$ [3]	-	12	20	-	25	ns
		$V_{CC} = 4.5\text{ V to }5.5\text{ V}$ [3]	-	9.0	14	-	17	ns
C_{PD}	power dissipation capacitance	$C_L = 50\text{ pF}$; $f_i = 1\text{ MHz}$; $V_I = GND\text{ to }V_{CC}$ [4]	-	24	-	-	-	pF

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

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

[3] Typical values are measured at nominal supply voltage ($V_{CC} = 3.3\text{ V}$ and $V_{CC} = 5.0\text{ V}$).

[4] C_{PD} is used to determine the dynamic power dissipation (P_D in μW).

$$P_D = C_{PD} \times V_{CC}^2 \times f_i \times N + \Sigma(C_L \times V_{CC}^2 \times f_o) \text{ where:}$$

f_i = input frequency in MHz, f_o = output frequency in MHz

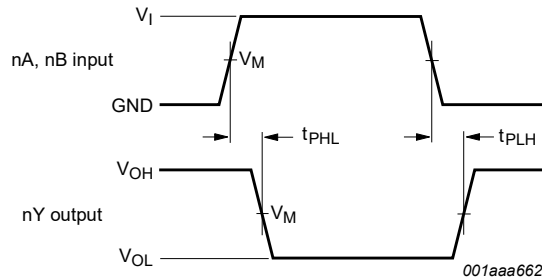
C_L = output load capacitance in pF

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



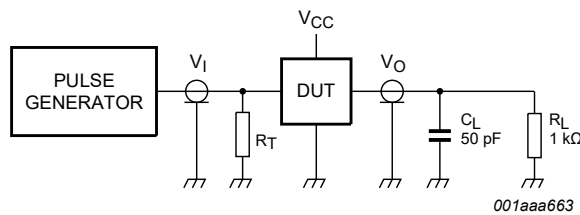
Measurement points are given in [Table 8](#).

V_{OL} and V_{OH} are typical voltage output levels that occur with the output load.

Fig. 4. The input (nA, nB) to output (nY) propagation delays

Table 8. Measurement points

Supply voltage	Input	Output
V_{CC}	V_M	V_M
< 2.7 V	$0.5V_{CC}$	$0.5V_{CC}$
2.7 V to 3.6 V	1.5 V	1.5 V
≥ 4.5 V	$0.5V_{CC}$	$0.5V_{CC}$



Test data is given in [Table 9](#).

Definitions test circuit:

R_T = Termination resistance should be equal to output impedance Z_o of the pulse generator;

R_L = Load resistance;

C_L = Load capacitance including jig and probe capacitance.

Fig. 5. Test circuit for measuring switching times

Table 9. Test data

Supply voltage	Input	t_r, t_f
V_{CC}	V_I	t_r, t_f
< 2.7 V	V_{CC}	≤ 2.5 ns
2.7 V to 3.6 V	2.7 V	≤ 2.5 ns
≥ 4.5 V	V_{CC}	≤ 2.5 ns

12. Transfer characteristics

Table 10. Transfer characteristics

$GND = 0\text{ V}$; See [Fig. 6](#) to [Fig. 10](#).

Symbol	Parameter	Conditions	-40 °C to +85 °C			-40 °C to +125 °C		Unit
			Min	Typ [1]	Max	Min	Max	
V_{T+}	positive-going threshold voltage	see Fig. 6 to Fig. 10						
		$V_{CC} = 1.2\text{ V}$	-	0.70	-	-	-	V
		$V_{CC} = 2.0\text{ V}$	0.8	1.10	1.4	0.8	1.4	V
		$V_{CC} = 2.7\text{ V}$	1.0	1.45	2.0	1.0	2.0	V
		$V_{CC} = 3.0\text{ V}$	1.2	1.60	2.2	1.2	2.2	V
		$V_{CC} = 3.6\text{ V}$	1.5	1.95	2.4	1.5	2.4	V
		$V_{CC} = 4.5\text{ V}$	1.7	2.50	3.2	1.7	3.2	V
V_{T-}	negative-going threshold voltage	see Fig. 6 to Fig. 10						
		$V_{CC} = 1.2\text{ V}$	-	0.34	-	-	-	V
		$V_{CC} = 2.0\text{ V}$	0.3	0.65	0.9	0.3	0.9	V
		$V_{CC} = 2.7\text{ V}$	0.4	0.90	1.4	0.4	1.4	V
		$V_{CC} = 3.0\text{ V}$	0.6	1.05	1.5	0.6	1.5	V
		$V_{CC} = 3.6\text{ V}$	0.8	1.30	1.8	0.8	1.8	V
		$V_{CC} = 4.5\text{ V}$	0.9	1.60	2.0	0.9	2.0	V
V_H	hysteresis voltage	$(V_{T+} - V_{T-})$; see Fig. 6 to Fig. 10						
		$V_{CC} = 1.2\text{ V}$	-	0.3	-	-	-	V
		$V_{CC} = 2.0\text{ V}$	0.2	0.55	0.8	0.2	0.8	V
		$V_{CC} = 2.7\text{ V}$	0.3	0.60	1.1	0.3	1.1	V
		$V_{CC} = 3.0\text{ V}$	0.4	0.65	1.2	0.4	1.2	V
		$V_{CC} = 3.6\text{ V}$	0.4	0.70	1.2	0.4	1.2	V
		$V_{CC} = 4.5\text{ V}$	0.4	0.80	1.4	0.4	1.4	V
$V_{CC} = 5.5\text{ V}$	0.6	1.00	1.5	0.6	1.5	V		

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

12.1. Waveforms transfer characteristics

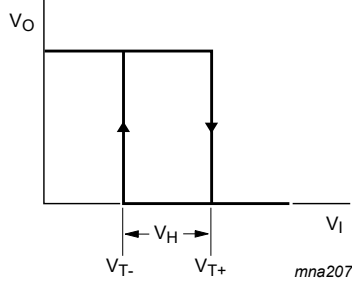
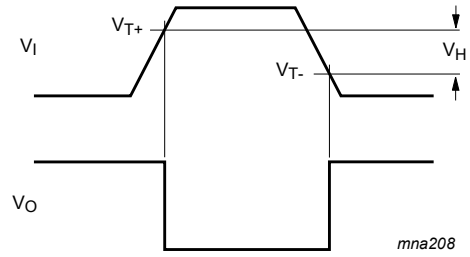
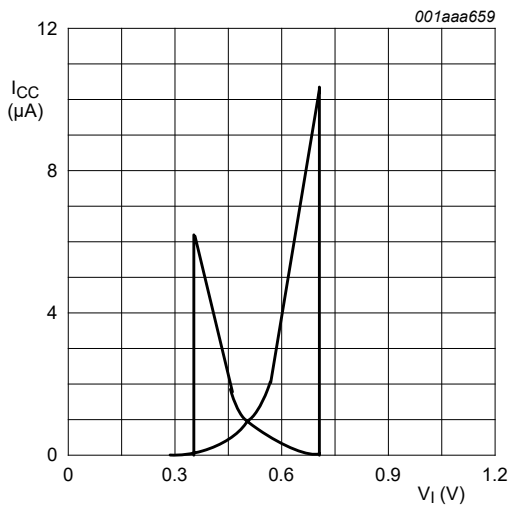


Fig. 6. Transfer characteristic

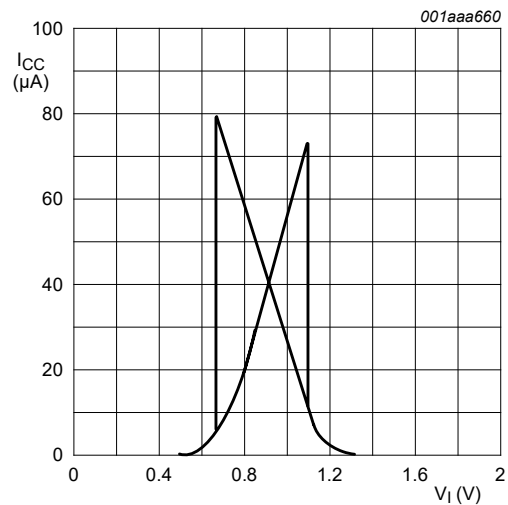


V_{T+} and V_{T-} limits at 70 % and 20 %.

Fig. 7. Definition of V_{T+} , V_{T-} and V_H 

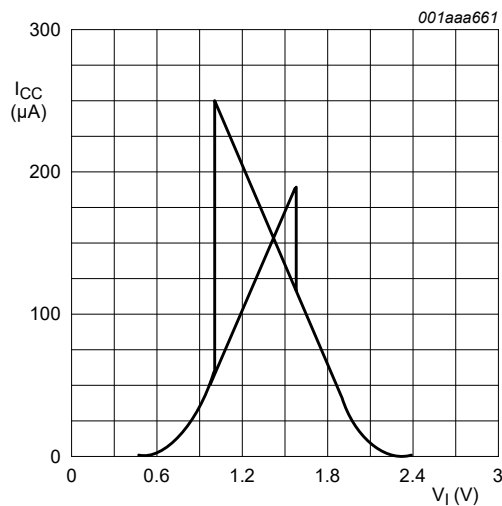
$V_{CC} = 1.2$ V.

Fig. 8. Typical 74LV132-Q100 transfer characteristics



$V_{CC} = 2.0$ V.

Fig. 9. Typical 74LV132-Q100 transfer characteristics



$V_{CC} = 3.0$ V.

Fig. 10. Typical 74LV132-Q100 transfer characteristics

13. Package outline

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

SOT108-1

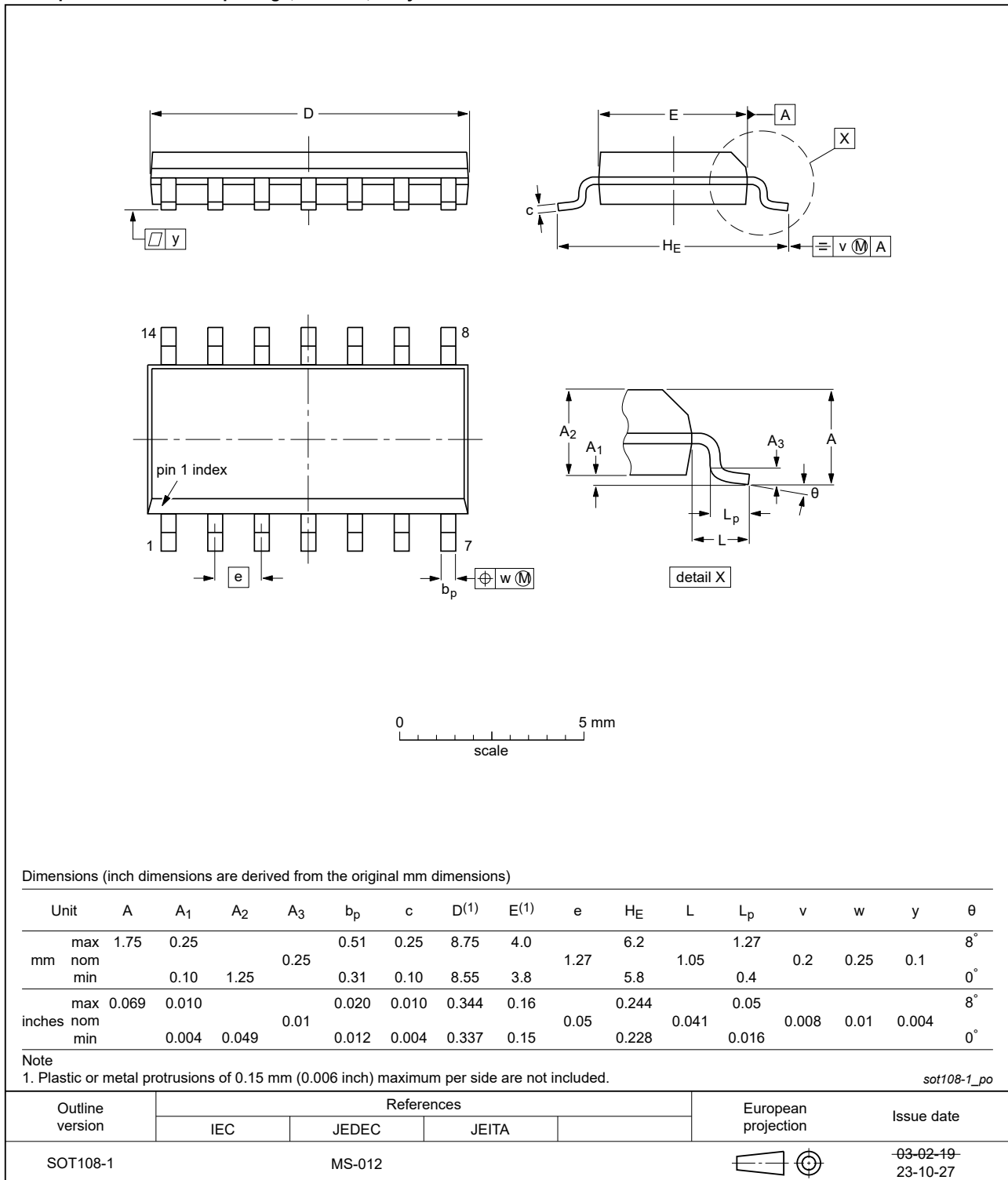


Fig. 11. Package outline SOT108-1 (SO14)

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

SOT402-1

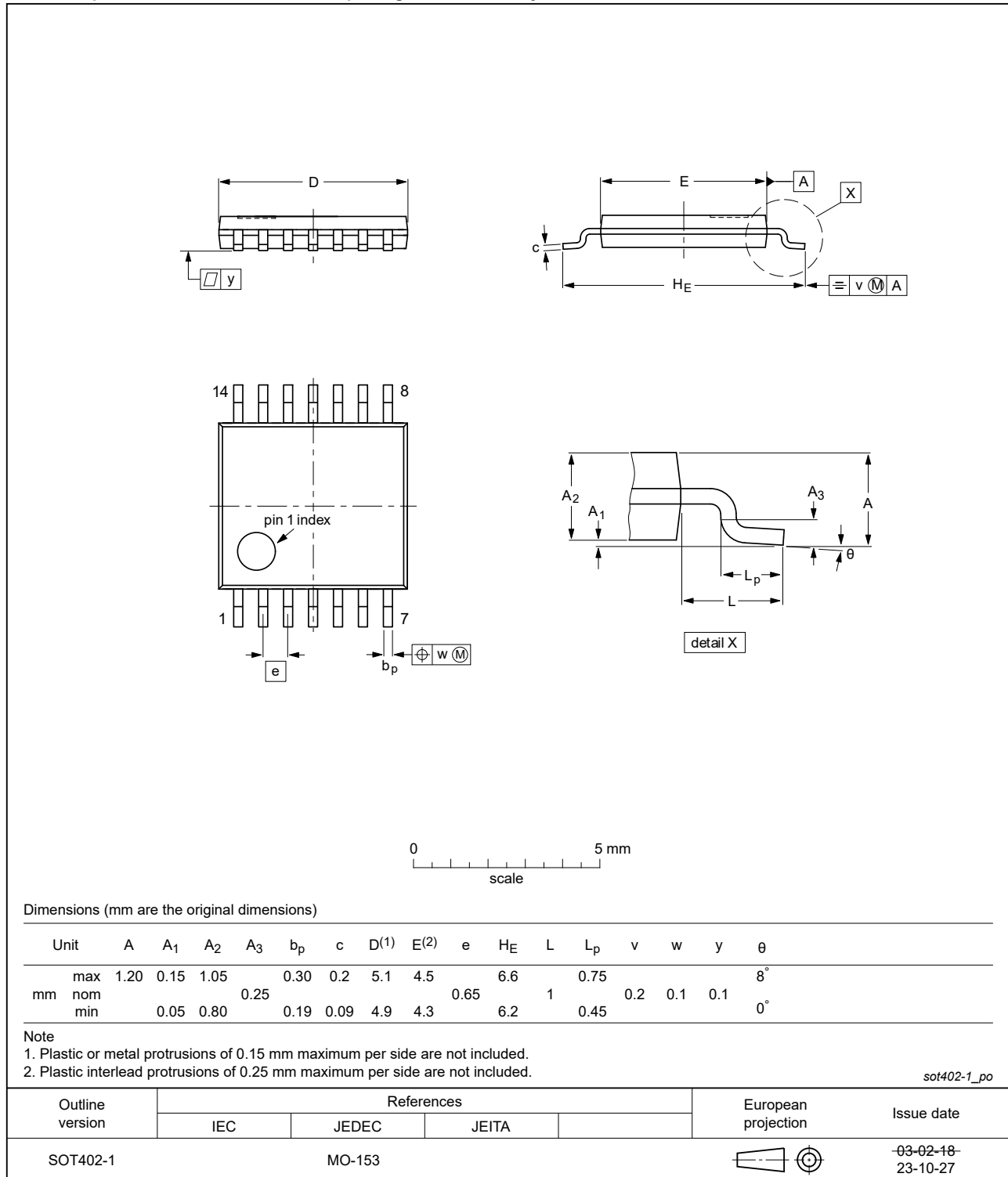


Fig. 12. Package outline SOT402-1 (TSSOP14)

14. Abbreviations

Table 11. 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

15. Revision history

Table 12. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
74LV132_Q100 v.3	20240130	Product data sheet	-	74LV132_Q100 v.2
Modifications:	<ul style="list-style-type: none"> • Section 2: ESD specification updated according to the latest JEDEC standard. • Fig. 11, Fig. 12: Aligned SO and TSSOP package outline drawings to JEDEC MS-012 and MO-153 			
74LV132_Q100 v.2	20200520	Product data sheet	-	74LV132_Q100 v.1
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. • Table 4: Derating values for P_{tot} total power dissipation updated. • Fig. 13: Package outline drawing SOT762-1 (DHVQFN14) updated. 			
74LV132_Q100 v.1	20131111	Product data sheet	-	-

16. 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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