



74HC11; 74HCT11

Triple 3-input AND gate

Rev. 9 — 21 February 2024

Product data sheet

1. General description

The 74HC11; 74HCT11 is a triple 3-input AND gate. Inputs include clamp diodes. This enables the use of current limiting resistors to interface inputs to voltages in excess of V_{CC} .

2. Features and benefits

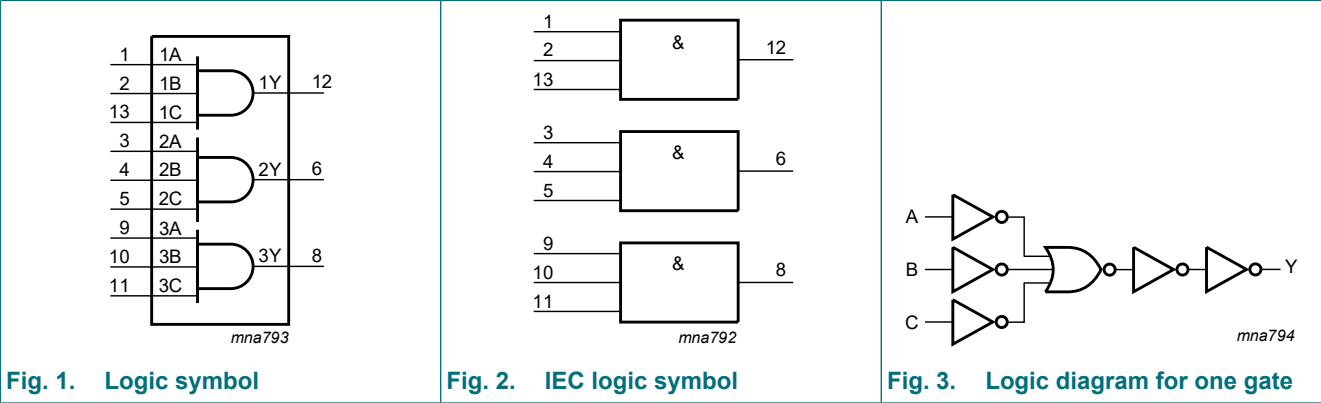
- Wide supply voltage range from 2.0 to 6.0 V
- CMOS low power dissipation
- High noise immunity
- Latch-up performance exceeds 100 mA per JESD 78 Class II Level B
- Input levels:
 - For 74HC11: CMOS level
 - For 74HCT11: TTL level
- Complies with JEDEC standards:
 - JESD8C (2.7 V to 3.6 V)
 - JESD7A (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
- Specified from -40 °C to +85 °C and from -40 °C to +125 °C

3. Ordering information

Table 1. Ordering information

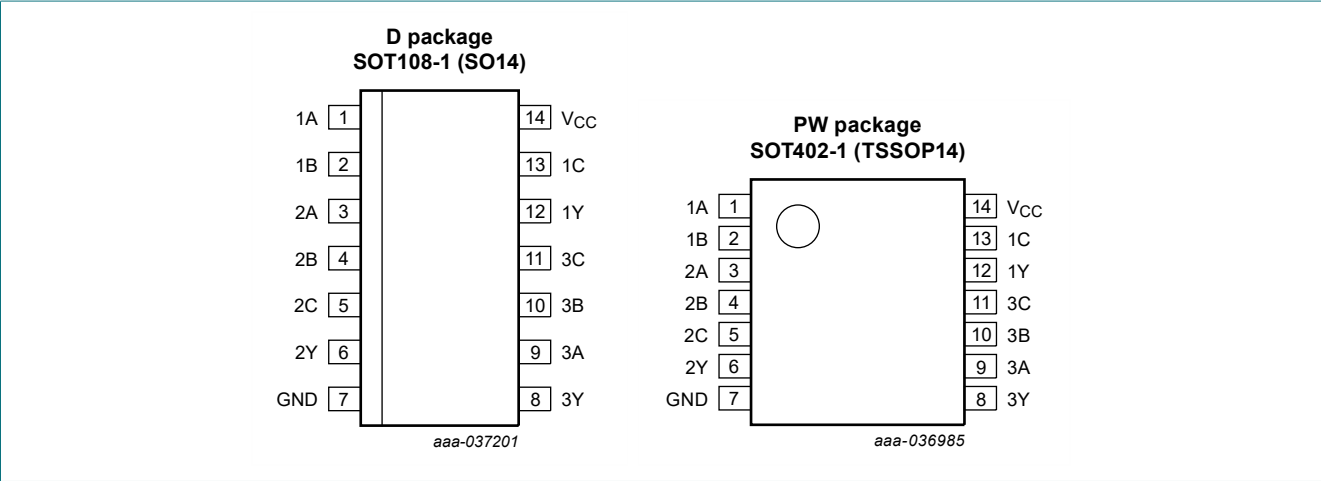
Type number	Package			
	Temperature range	Name	Description	Version
74HC11D 74HCT11D	-40 °C to +125 °C	SO14	plastic small outline package; 14 leads; body width 3.9 mm	SOT108-1
74HC11PW 74HCT11PW	-40 °C to +125 °C	TSSOP14	plastic thin shrink small outline package; 14 leads; body width 4.4 mm	SOT402-1

4. Functional diagram



5. Pinning information

5.1. Pinning



5.2. Pin description

Table 2. Pin description

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

6. Functional description

Table 3. Function selection

H = HIGH voltage level; L = LOW voltage level; X = don't care

Input			Output
nA	nB	nC	nY
L	X	X	L
X	L	X	L
X	X	L	L
H	H	H	H

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	-0.5 V < V _O < V _{CC} + 0.5 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	[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	74HC11			74HCT11			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	-	+125	-40	-	+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	
74HC11										
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 = -4.0 mA; V _{CC} = 4.5 V	3.98	4.32	-	3.84	-	3.7	-	V
		I _O = -5.2 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 = 4.0 mA; V _{CC} = 4.5 V	-	0.15	0.26	-	0.33	-	0.4	V
		I _O = 5.2 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	-	±1	µA
I _{CC}	supply current	V _I = V _{CC} or GND; I _O = 0 A; V _{CC} = 6.0 V	-	-	2.0	-	20	-	40	µA
C _I	input capacitance		-	3.5	-	-	-	-	-	pF
74HCT11										
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 = -4.0 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 _I	input leakage current	V _I = V _{CC} or GND; V _{CC} = 5.5 V	-	-	±0.1	-	±1	-	±1	µA
I _{CC}	supply current	V _I = V _{CC} or GND; I _O = 0 A; V _{CC} = 5.5 V	-	-	2.0	-	20	-	40	µA

Symbol	Parameter	Conditions	25 °C			-40 °C to +85 °C		-40 °C to +125 °C		Unit
			Min	Typ	Max	Min	Max	Min	Max	
ΔI_{CC}	additional supply current	per input pin; $V_I = V_{CC} - 2.1\text{ V}$; $I_O = 0\text{ A}$; other inputs at V_{CC} or GND; $V_{CC} = 4.5\text{ V}$ to 5.5 V	-	100	360	-	450	-	490	μA
C_I	input capacitance		-	3.5	-	-	-	-	-	pF

10. Dynamic characteristics

Table 7. Dynamic characteristics

GND = 0 V; $C_L = 50\text{ pF}$; for test circuit see Fig. 5.

Symbol	Parameter	Conditions	25 °C			-40 °C to +85 °C		-40 °C to +125 °C		Unit
			Min	Typ	Max	Min	Max	Min	Max	
74HC11										
t_{pd}	propagation delay	nA, nB to nY; see Fig. 4 [1]								
		$V_{CC} = 2.0\text{ V}$	-	32	100	-	125	-	150	ns
		$V_{CC} = 4.5\text{ V}$	-	12	20	-	25	-	30	ns
		$V_{CC} = 5.0\text{ V}$; $C_L = 15\text{ pF}$	-	9	-	-	-	-	-	ns
		$V_{CC} = 6.0\text{ V}$	-	10	17	-	21	-	26	ns
t_t	transition time	see Fig. 4 [2]								
		$V_{CC} = 2.0\text{ V}$	-	19	75	-	95	-	110	ns
		$V_{CC} = 4.5\text{ V}$	-	7	15	-	19	-	22	ns
		$V_{CC} = 6.0\text{ V}$	-	6	13	-	16	-	19	ns
C_{PD}	power dissipation capacitance	per package; $V_I = \text{GND to } V_{CC}$ [3]	-	18	-	-	-	-	-	pF
74HCT11										
t_{pd}	propagation delay	nA, nB to nY; see Fig. 4 [1]								
		$V_{CC} = 4.5\text{ V}$	-	16	24	-	30	-	36	ns
		$V_{CC} = 5.0\text{ V}$; $C_L = 15\text{ pF}$	-	11	-	-	-	-	-	ns
t_t	transition time	$V_{CC} = 4.5\text{ V}$; see Fig. 4 [2]	-	7	15	-	19	-	22	ns
C_{PD}	power dissipation capacitance	per package; $V_I = \text{GND to } V_{CC} - 1.5\text{ V}$ [3]	-	20	-	-	-	-	-	pF

[1] t_{pd} is the same as t_{PHL} and t_{PLH} .
[2] t_t is the same as t_{THL} and t_{TLH} .
[3] C_{PD} is used to determine the dynamic power dissipation (P_D in μW):
 $P_D = C_{PD} \times V_{CC}^2 \times f_i \times N + \Sigma(C_L \times V_{CC}^2 \times f_o)$ 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 outputs.

10.1. Waveforms and test circuit

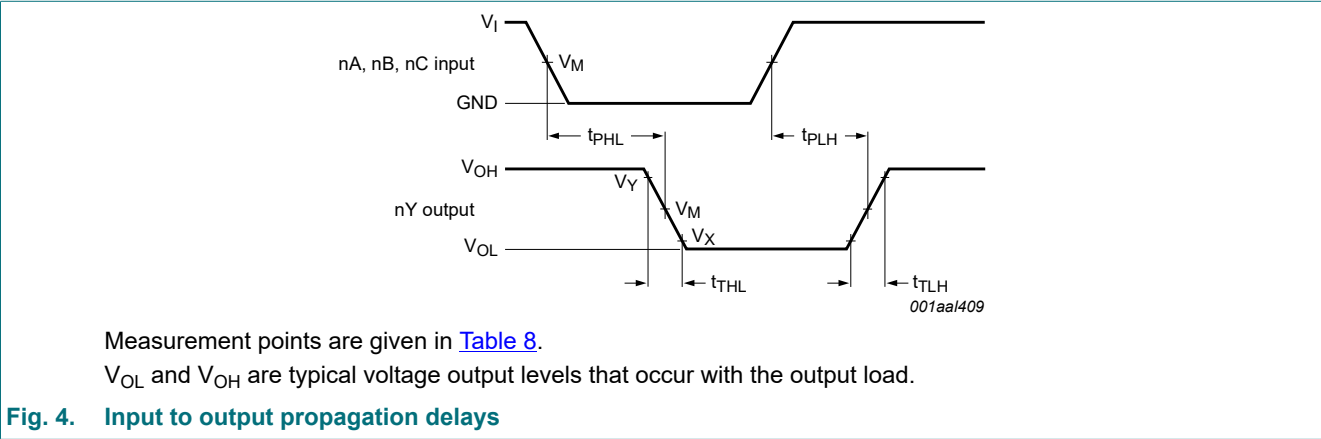


Table 8. Measurement points

Type	Input	Output		
	V_M	V_M	V_X	V_Y
74HC11	$0.5V_{CC}$	$0.5V_{CC}$	$0.1V_{CC}$	$0.9V_{CC}$
74HCT11	1.3 V	1.3 V	$0.1V_{CC}$	$0.9V_{CC}$

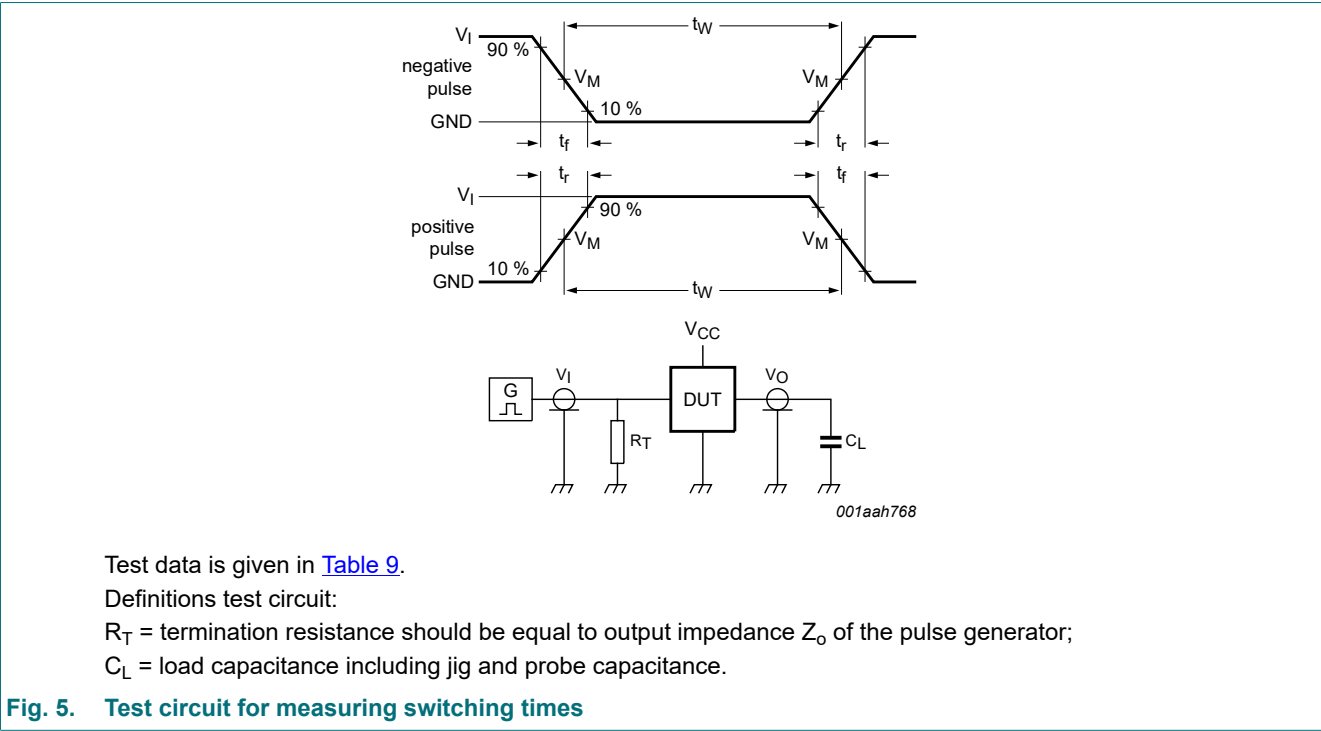


Table 9. Test data

Type	Input		Load	Test
	V_I	t_r, t_f	C_L	
74HC11	V_{CC}	6.0 ns	15 pF, 50 pF	t_{PLH}, t_{PHL}
74HCT11	3.0 V	6.0 ns	15 pF, 50 pF	t_{PLH}, t_{PHL}

11. Package outline

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

SOT108-1

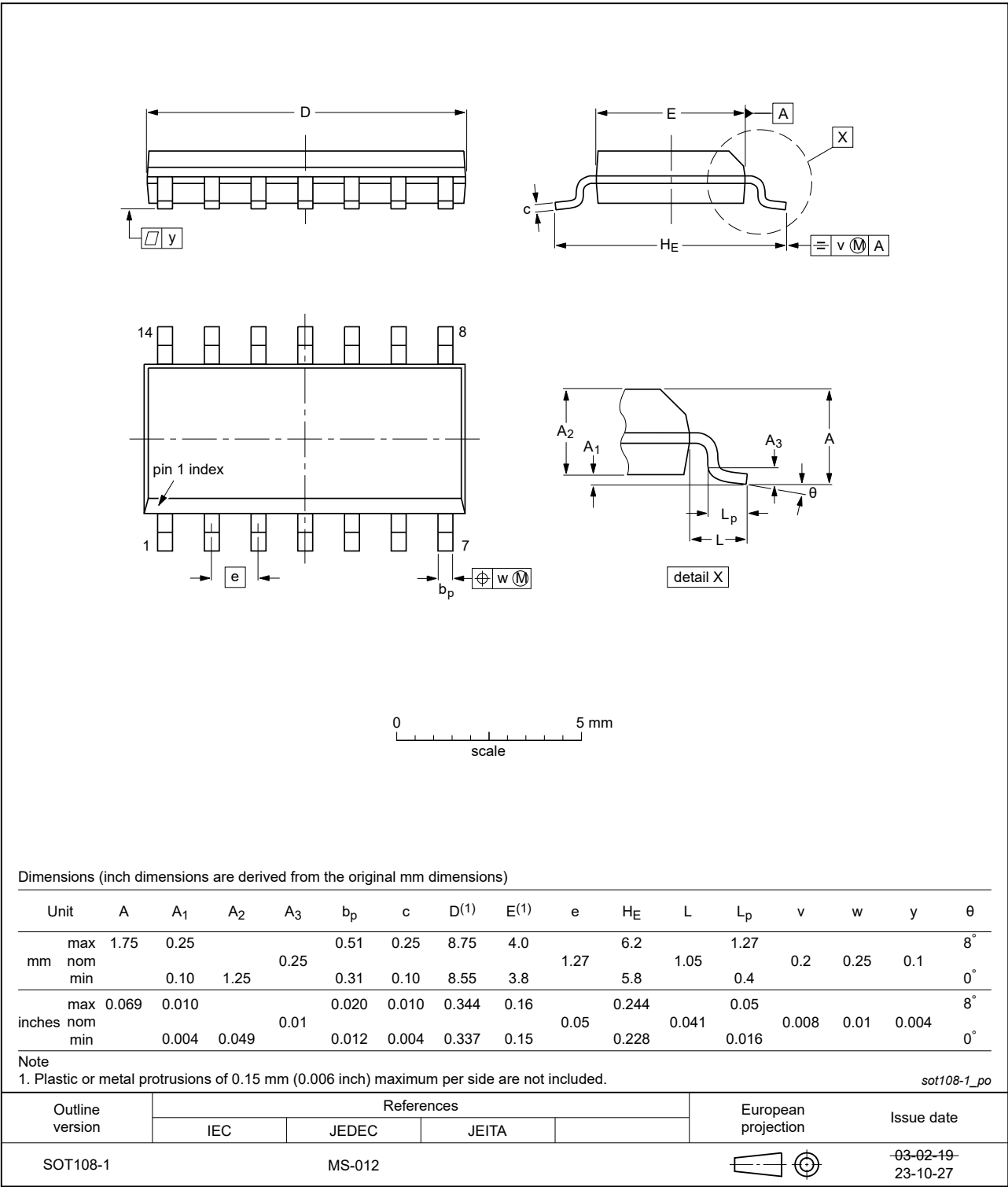


Fig. 6. Package outline SOT108-1 (SO14)

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

SOT402-1



Fig. 7. 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_HCT11 v.9	20240221	Product data sheet	-	74HC_HCT11 v.8
Modifications:	- Section 2: ESD specification updated according to the latest JEDEC standard. - Fig. 6, Fig. 7: Aligned SO and TSSOP package outline drawings to JEDEC MS-012 and MO-153			
74HC_HCT11 v.8	20210811	Product data sheet	-	74HC_HCT11 v.7
Modifications:	- Section 2 updated. - Type number 74HC11DB (SOT337-1/SSOP14) removed.			
74HC_HCT11 v.7	20210108	Product data sheet	-	74HC_HCT11 v.6
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. - Type number 74HCT11DB (SOT337-1/SSOP14) removed. - Section 7: Derating values for P_{tot} total power dissipation have been updated.			
74HC_HCT11 v.6	20151119	Product data sheet	-	74HC_HCT11 v.5
Modifications:	Type numbers 74HC11N and 74HCT11N (SOT27-1) removed.			
74HC_HCT11 v.5	20111216	Product data sheet	-	74HC_HCT11 v.4
Modifications:	Legal pages updated.			
74HC_HCT11 v.4	20100325	Product data sheet	-	74HC_HCT11 v.3
74HC_HCT11 v.3	20100209	Product data sheet	-	74HC_HCT11_CNV v.2
74HC_HCT11_CNV v.2	19970827	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.

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