

74F38

Quad 2-input NAND buffer (open collector)

Rev. 3 — 10 January 2014

Product data sheet

1. General description

The 74F38 provides four 2-input NAND functions with open-collector outputs.

2. Features and benefits

- Industrial temperature range available (–40 °C to +85 °C)

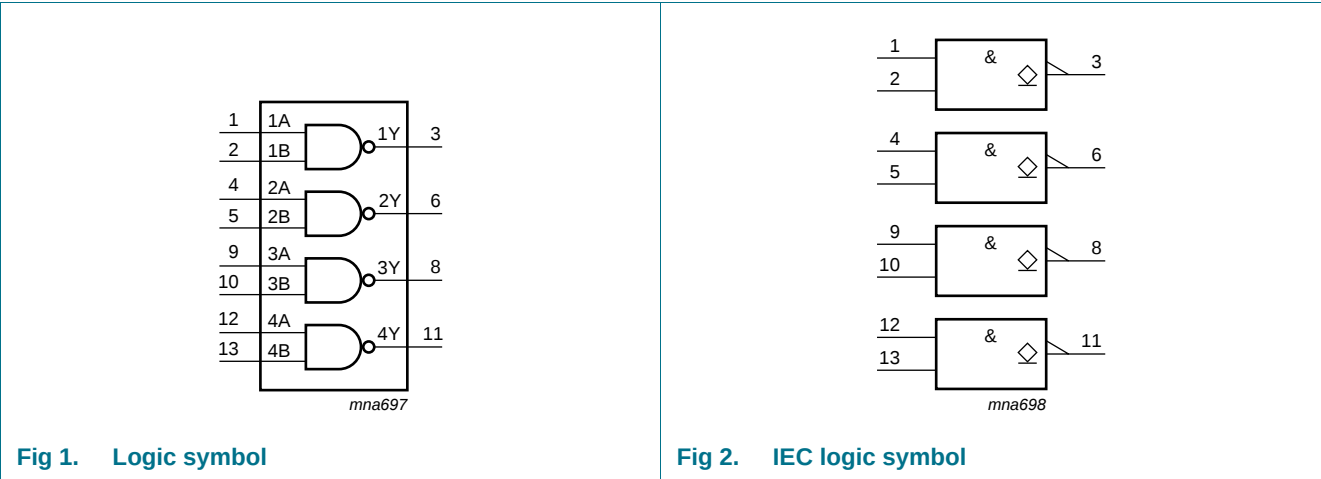
3. Ordering information

Table 1. Ordering information

Type number	Package			
	Temperature range	Name	Description	Version
N74F38N	0 °C to +70 °C	DIP14	plastic dual in-line package; 14 leads (300 mil)	SOT27-1
I74F38N	–40 °C to +85 °C			
N74F38D	0 °C to +70 °C	SO14	plastic small outline package; 14 leads; body width 3.9 mm	SOT108-1
I74F38D	–40 °C to +85 °C			

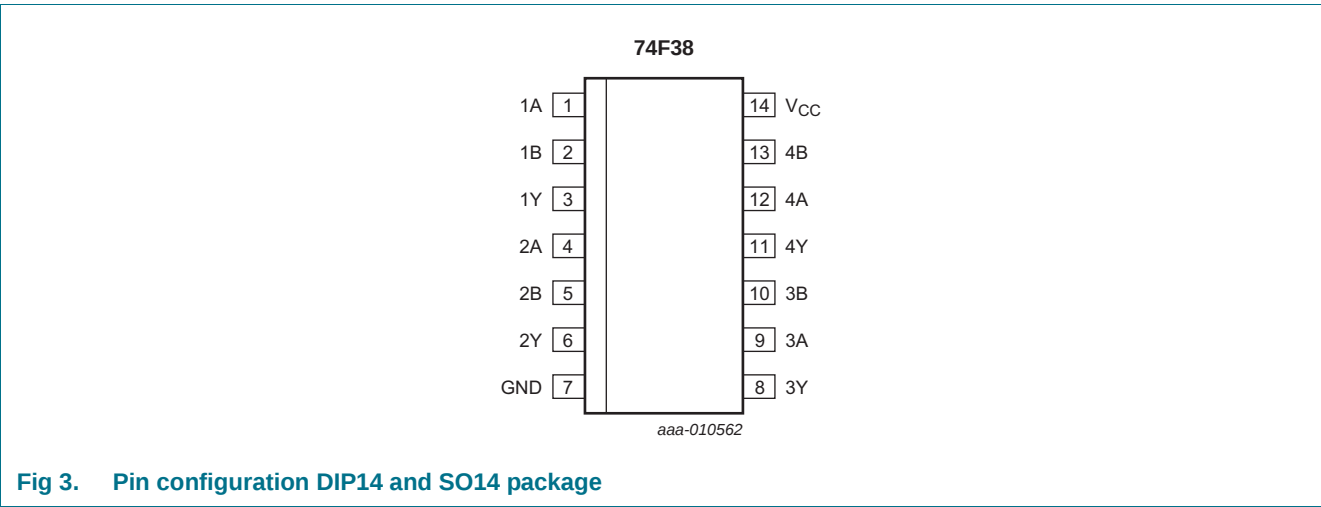


4. Functional diagram



5. Pinning information

5.1 Pinning



5.2 Pin description

Table 2. Pin description

Symbol	Pin	Description	Unit load HIGH/LOW	Load value ^{[1][2]} HIGH/LOW
1A, 2A, 3A, 4A	1, 4, 9, 12	data input	1.0/2.0	20 μ A/1.2 mA
1B, 2B, 3B, 4B	2, 5, 10, 13	data input	1.0/2.0	20 μ A/1.2 mA
1Y, 2Y, 3Y, 4Y	3, 6, 8, 11	data output	OC/106.7	OC/64 mA
GND	7	ground (0 V)	-	-
V _{CC}	14	supply voltage	-	-

[1] One FAST Unit Load (UL) is defined as 20 μ A in HIGH state, 0.6 mA in LOW state.

[2] OC = open collector.

6. Functional description

Table 3. Function table^[1]

Input		Output
nA	nB	nY
L	L	H
L	H	H
H	L	H
H	H	L

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

7. Limiting values

Table 4. Limiting values

In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions	Min	Max	Unit
V _{CC}	supply voltage		-0.5	+7.0	V
V _I	input voltage		^[1] -0.5	+7.0	V
V _O	output voltage	output in HIGH-state	^[1] -0.5	V _{CC}	V
I _{IK}	input clamping current	V _I < 0 V	-30	+5	mA
I _O	output current	output in LOW-state	-	128	mA
T _{amb}	ambient temperature	in free-air	^[2]		
		commercial	0	70	°C
		industrial	-40	+85	°C
T _{stg}	storage temperature		-65	+150	°C

[1] The input and output voltage ratings may be exceeded if the input and output current ratings are observed.

[2] The performance capability of a high-performance integrated circuit in conjunction with its thermal environment can create junction temperatures which are detrimental to reliability. The maximum junction temperature of this integrated circuit should not exceed 150 °C.

8. Recommended operating conditions

Table 5. Recommended operating conditions

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{CC}	supply voltage		4.5	5.0	5.5	V
V_{IH}	HIGH-level input voltage		2.0	-	-	V
V_{IL}	LOW-level input voltage		-	-	0.8	V
V_{OH}	HIGH-level output voltage		-	-	4.5	V
I_{IK}	input clamping current		-18	-	-	mA
I_{OL}	LOW-level output current		-	-	64	mA

9. Static characteristics

Table 6. Static characteristics

Symbol	Parameter	Conditions	25 °C			0 °C to +70 °C		Unit
			Min	Typ ^[1]	Max	Min	Max	
V_{IK}	input clamping voltage	$V_{CC} = 4.5\text{ V}$; $I_{IK} = -18\text{ mA}$	-1.2	-0.73	-	-1.2	-	V
V_{OL}	LOW-level output voltage	$V_{CC} = 4.5\text{ V}$; $V_{IL} = 0.8\text{ V}$; $V_{IH} = 2.0\text{ V}$ $I_{OL} = 64\text{ mA}$						
		$V_{CC} = \pm 10\%$	-	-	-	-	0.55	V
		$V_{CC} = \pm 5\%$	-	0.42	-	-	0.55	V
I_I	input leakage current	$V_{CC} = 0\text{ V}$; $V_I = 7.0\text{ V}$	-	-	-	-	100	μA
I_{IH}	HIGH-level input current	$V_{CC} = 5.5\text{ V}$; $V_I = 2.7\text{ V}$	-	-	-	-	20	μA
I_{IL}	LOW-level input current	$V_{CC} = 5.5\text{ V}$; $V_I = 0.5\text{ V}$	-	-	-	-20	-	μA
I_{CC}	supply current	$V_{CC} = 5.5\text{ V}$						
		$V_I = \text{GND}$	-	4	-	-	7	mA
		$V_I = 4.5\text{ V}$	-	22	-	-	30	mA

[1] All typical values are measured at $V_{CC} = 5\text{ V}$.

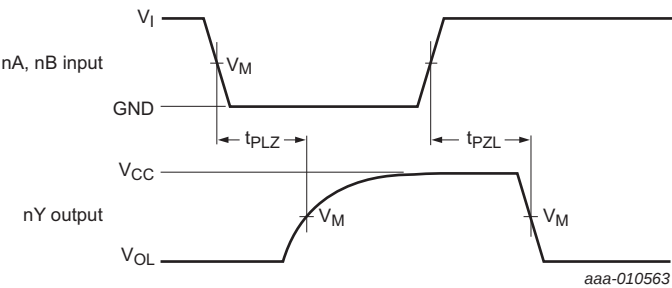
10. Dynamic characteristics

Table 7. Dynamic characteristics

$GND = 0\text{ V}$. Test circuit is shown in [Figure 6](#).

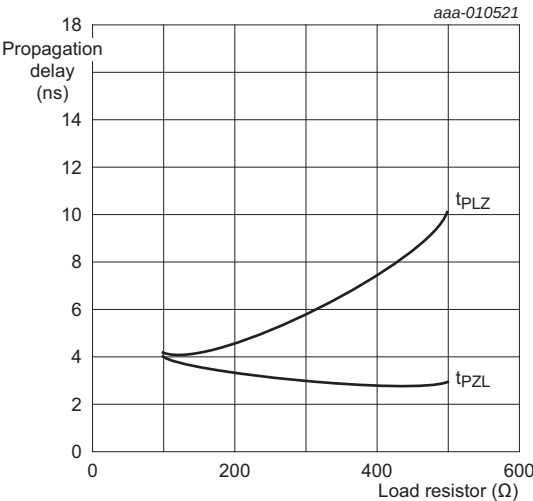
Symbol	Parameter	Conditions	25 °C; $V_{CC} = 5.0\text{ V}$			0 °C to +70 °C; $V_{CC} = 5.0\text{ V} \pm 0.5\text{ V}$		-40 °C to +85 °C; $V_{CC} = 5.0\text{ V} \pm 0.5\text{ V}$		Unit
			Min	Typ	Max	Min	Max	Min	Max	
t_{PZL}	OFF-state to LOW propagation delay	nA, nB to nY; see Figure 4	1.5	3.0	5.0	1.5	5.5	1.5	6.0	ns
t_{PLZ}	LOW to OFF-state propagation delay	nA, nB to nY; see Figure 4	7.5	10.0	12.5	7.5	13.0	7.5	14.5	ns

11. Waveforms



$V_M = 1.5\text{ V}$
 V_{OL} is a typical output voltage level that occurs with the output load.

Fig 4. Propagation delay for inverting outputs



When using open collector parts, the value of the pull-up resistor greatly affects the value of the t_{PLZ} . For example, changing the specified pull-up resistor value from 500 Ω to 100 Ω improves the t_{PLZ} up to 50% with only a slight increase in the t_{PZL} . However, if the value of the pull-up resistor is changed, the user must ensure that the total I_{OL} current through the resistor and the total I_{IL} of the receivers, does not exceed the I_{OL} minimum specification.

Fig 5. Typical propagation delays versus load for open collector outputs

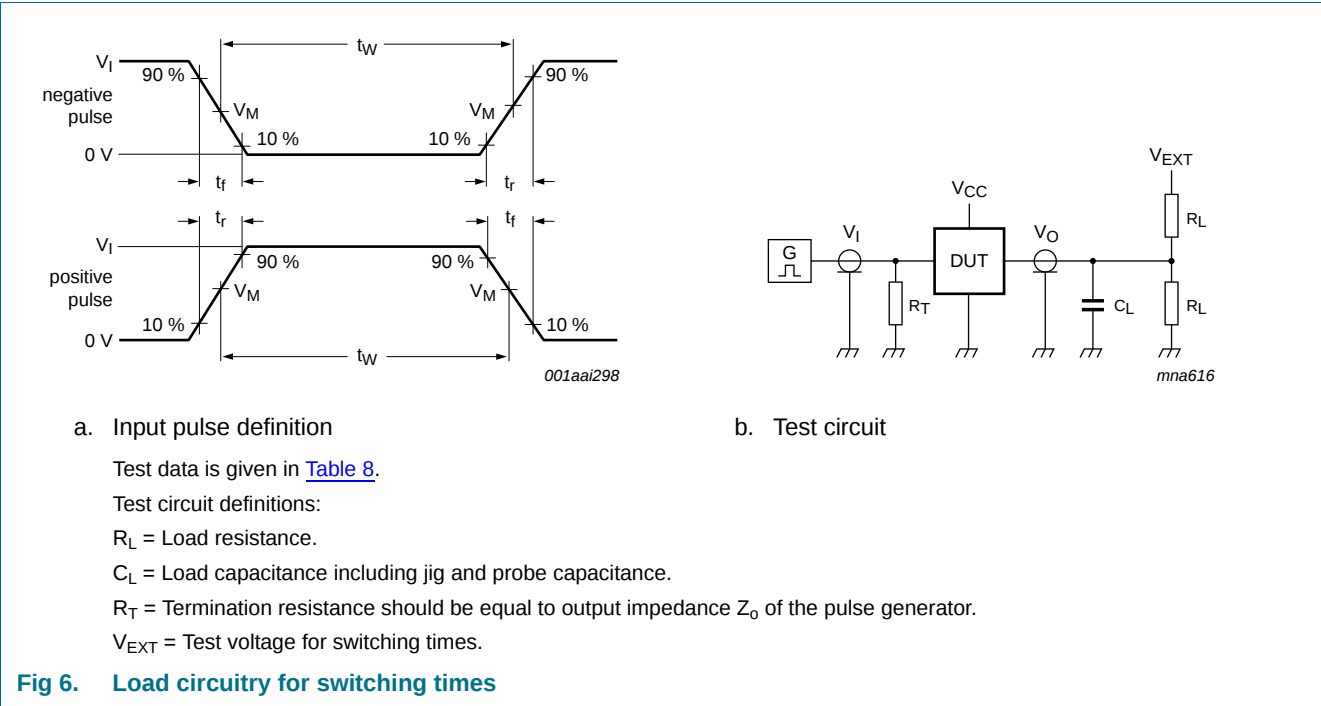


Fig 6. Load circuitry for switching times

Table 8. Test data

Input				Load		V_{EXT}
V_I	f_i	t_W	t_r, t_f	C_L	R_L	t_{PZL}, t_{PLZ}
3.0 V	1 MHz	500 ns	≤ 2.5 ns	50 pF	500 Ω	7.0 V

12. Package outline

DIP14: plastic dual in-line package; 14 leads (300 mil)

SOT27-1

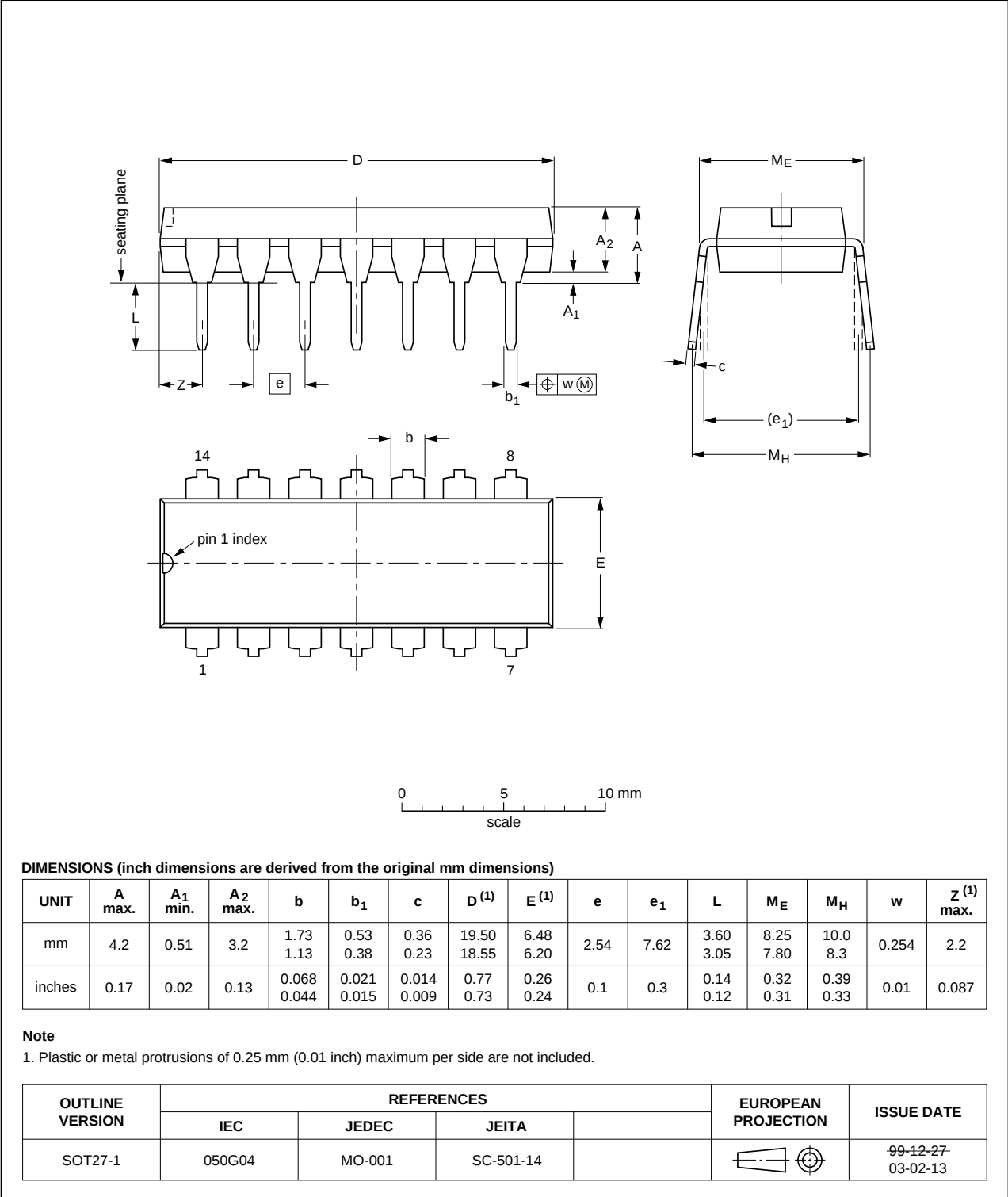


Fig 7. Package outline SOT27-1 (DIP14)

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

SOT108-1

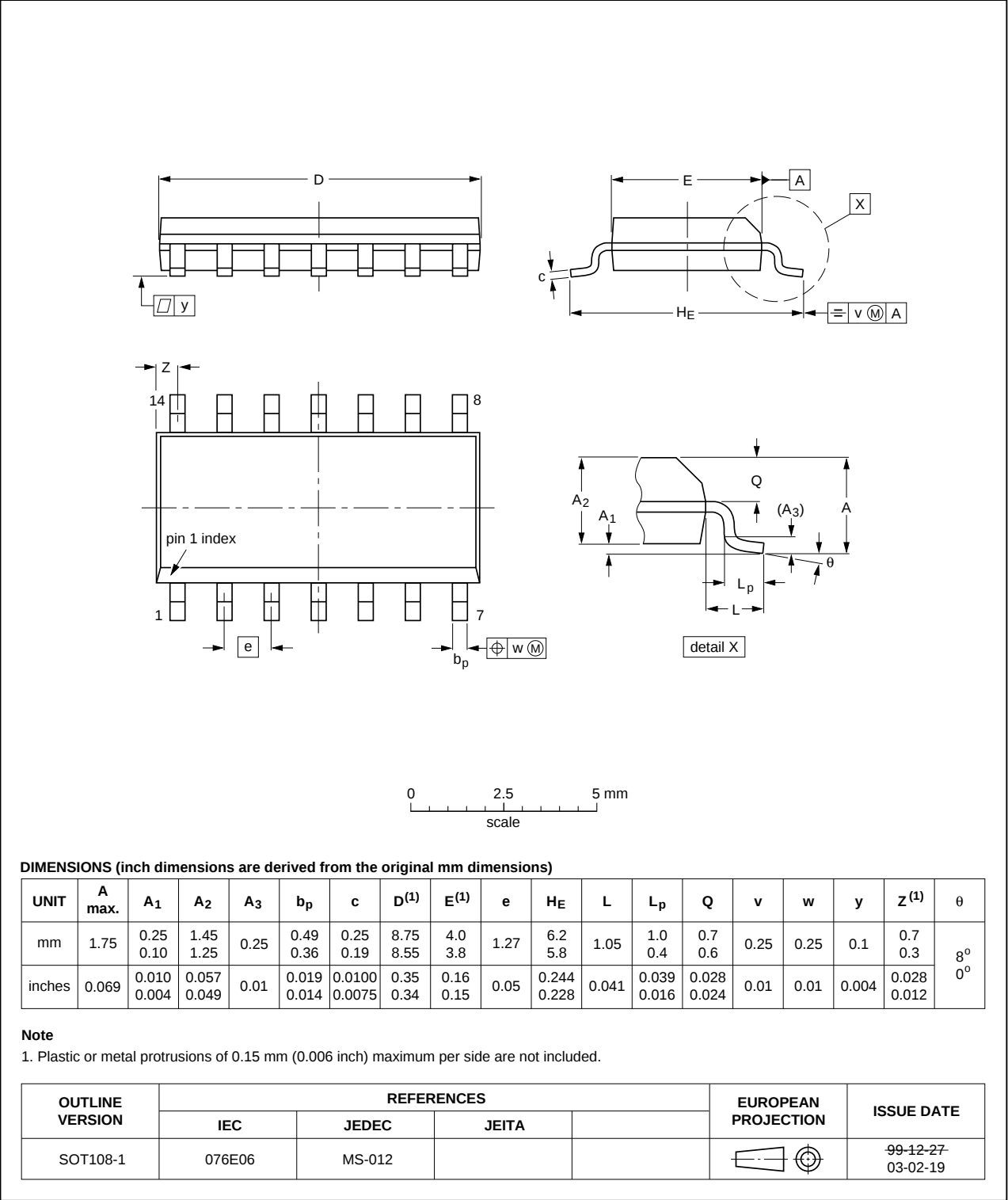


Fig 8. Package outline SOT108-1 (SO14)

13. Abbreviations

Table 9. Abbreviations

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

14. Revision history

Table 10. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
74F38 v.3	20140110	Product data sheet	-	74F38 v.2
Modifications:	- The format of this data sheet has been redesigned to comply with the new identity guidelines of NXP Semiconductors. - Legal texts have been adapted to the new company name where appropriate. - General update of values			
74F38 v.2	19901004	Product specification	-	-

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15.1 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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Date of release: 10 January 2014

Document identifier: 74F38