

# DATA SHEET

## **74F38**

Quad 2-input NAND buffer (open collector)

Product specification

1990 Oct 04

IC15 Data Handbook

Quad 2-input NAND buffer (open collector)

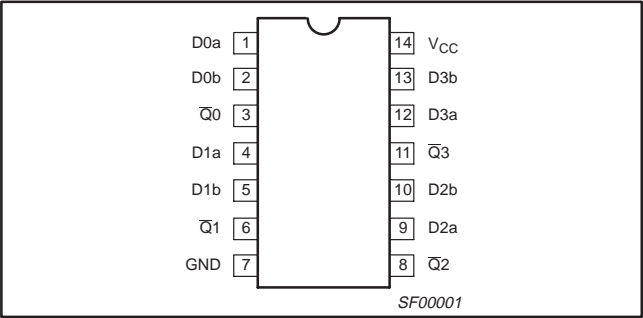
74F38

FEATURE

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

TYPE	TYPICAL PROPAGATION DELAY	TYPICAL SUPPLY CURRENT (TOTAL)
74F38	7.0ns	13mA

PIN CONFIGURATION



ORDERING INFORMATION

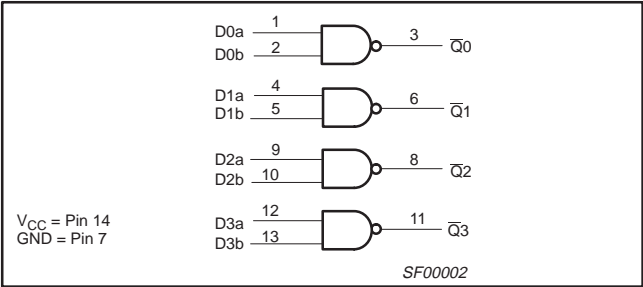
DESCRIPTION	ORDER CODE		PKG DWG #
	COMMERCIAL RANGE $V_{CC} = 5V \pm 10\%$ , $T_{amb} = 0^{\circ}C$ to $+70^{\circ}C$	INDUSTRIAL RANGE $V_{CC} = 5V \pm 10\%$ , $T_{amb} = -40^{\circ}C$ to $+85^{\circ}C$	
14-pin plastic DIP	N74F38N	I74F38N	SOT27-1
14-pin plastic SO	N74F38D	I74F38D	SOT108-1

INPUT AND OUTPUT LOADING AND FAN OUT TABLE

PINS	DESCRIPTION	74F (U.L.) HIGH/LOW	LOAD VALUE HIGH/LOW
Dna, Dnb	Data inputs	1.0/2.0	20μA/1.2mA
$\overline{Q}_n$	Data output	OC/106.7	OC/64mA

- NOTES:
- One (1.0) FAST unit load is defined as: 20μA in the high state and 0.6mA in the low state.
  - OC = open collector

LOGIC DIAGRAM

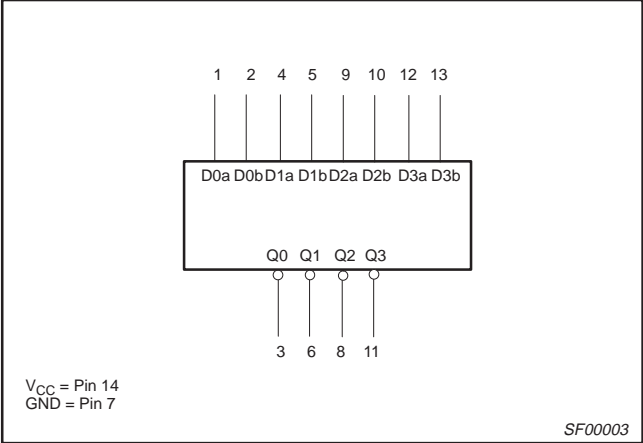


FUNCTION TABLE

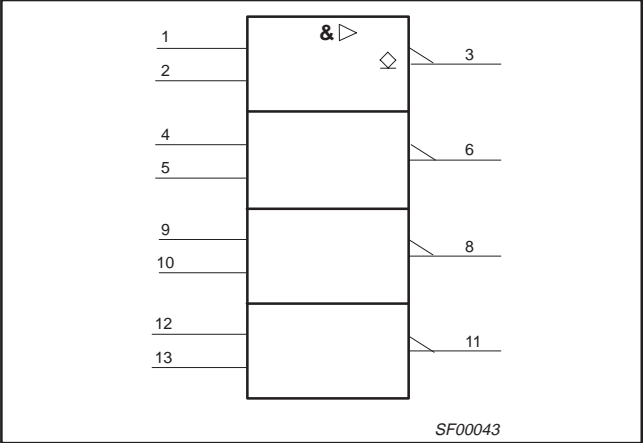
INPUTS		OUTPUT
Dna	Dnb	$\overline{Q}_n$
L	L	H
L	H	H
H	L	H
H	H	L

- NOTES:
- H = High voltage level  
L = Low voltage level

LOGIC SYMBOL



IEC/IEEE SYMBOL



## Quad 2-input NAND buffer (open collector)

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**ABSOLUTE MAXIMUM RATINGS**

(Operation beyond the limit set forth in this table may impair the useful life of the device.  
Unless otherwise noted these limits are over the operating free air temperature range.)

SYMBOL	PARAMETER		RATING	UNIT
$V_{CC}$	Supply voltage		-0.5 to +7.0	V
$V_{IN}$	Input voltage		-0.5 to +7.0	V
$I_{IN}$	Input current		-30 to +5	mA
$V_{OUT}$	Voltage applied to output in high output state		-0.5 to $V_{CC}$	V
$I_{OUT}$	Current applied to output in low output state		128	mA
$T_{amb}$	Operating free air temperature range	Commercial range	0 to +70	°C
		Industrial range	-40 to +85	°C
$T_{stg}$	Storage temperature range		-65 to +150	°C

**RECOMMENDED OPERATING CONDITIONS**

SYMBOL	PARAMETER		LIMITS			UNIT
			MIN	NOM	MAX	
$V_{CC}$	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
$I_{IK}$	Input clamp current				-18	mA
$V_{OH}$	High-level output voltage				4.5	V
$I_{OL}$	Low-level output current				64	mA
$T_{amb}$	Operating free air temperature range	Commercial range	0		+70	°C
		Industrial range	-40		+85	°C

**DC ELECTRICAL CHARACTERISTICS**

(Over recommended operating free-air temperature range unless otherwise noted.)

SYMBOL	PARAMETER		TEST CONDITIONS <sup>1</sup>		LIMITS			UNIT
					MIN	TYP <sup>2</sup>	MAX	
$I_{OH}$	High-level output current		$V_{CC} = \text{MIN}$ , $V_{IL} = \text{MAX}$ , $V_{IH} = \text{MIN}$ , $V_{OH} = \text{MAX}$				250	μA
$V_{OL}$	Low-level output voltage		$V_{CC} = \text{MIN}$ , $V_{IL} = \text{MAX}$	$\pm 10\%V_{CC}$			0.55	V
			$V_{IH} = \text{MIN}$ , $I_{OL} = \text{MAX}$	$\pm 5\%V_{CC}$		0.42	0.55	V
$V_{IK}$	Input clamp voltage		$V_{CC} = \text{MIN}$ , $I_I = I_{IK}$			-0.73	-1.2	V
$I_I$	Input current at maximum input voltage		$V_{CC} = \text{MAX}$ , $V_I = 7.0\text{V}$				100	μA
$I_{IH}$	High-level input current		$V_{CC} = \text{MAX}$ , $V_I = 2.7\text{V}$				20	μA
$I_{IL}$	Low-level input current		$V_{CC} = \text{MAX}$ , $V_I = 0.5\text{V}$				-1.2	mA
$I_{CC}$	Supply current (total)	$I_{CCH}$	$V_{CC} = \text{MAX}$	$V_{IN} = \text{GND}$		4.0	7.0	mA
		$I_{CCL}$	$V_{CC} = \text{MAX}$	$V_{IN} = 4.5\text{V}$		22	30	mA

**NOTES:**

- 1 For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions for the applicable type.  
2 All typical values are at  $V_{CC} = 5\text{V}$ ,  $T_{amb} = 25^\circ\text{C}$ .

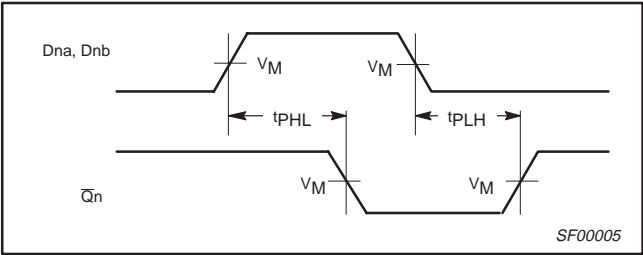
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AC ELECTRICAL CHARACTERISTICS

SYMBOL	PARAMETER	TEST CONDITION	LIMITS								UNIT
			V <sub>CC</sub> = +5.0V T <sub>amb</sub> = +25°C C <sub>L</sub> = 50pF, R <sub>L</sub> = 500Ω			V <sub>CC</sub> = +5.0V ± 10% T <sub>amb</sub> = 0°C to +70°C C <sub>L</sub> = 50pF, R <sub>L</sub> = 500Ω		V <sub>CC</sub> = +5.0V ± 10% T <sub>amb</sub> = −40°C to +85°C C <sub>L</sub> = 50pF, R <sub>L</sub> = 500Ω			
			MIN	TYP	MAX	MIN	MAX	MIN	MAX		
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation delay Dna, Dnb to Qn	Waveform 1	7.5 1.5	10.0 3.0	12.5 5.0	7.5 1.5	13.0 5.5	7.5 1.5	14.5 6.0	ns	

AC WAVEFORMS

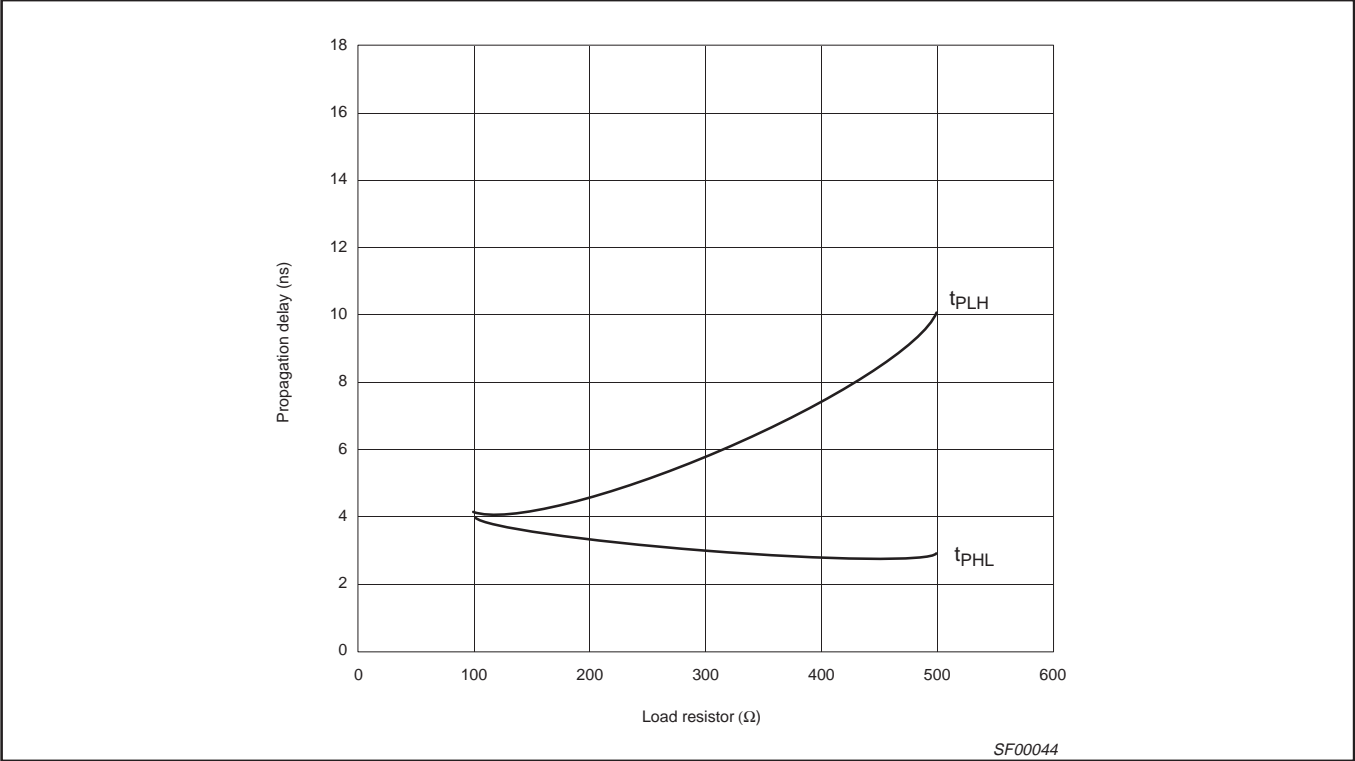


Waveform 1. Propagation delay for inverting outputs

NOTE:

For all waveforms,  $V_M = 1.5V$ .

TYPICAL PROPAGATION DELAYS VERSUS LOAD FOR OPEN COLLECTOR OUTPUTS



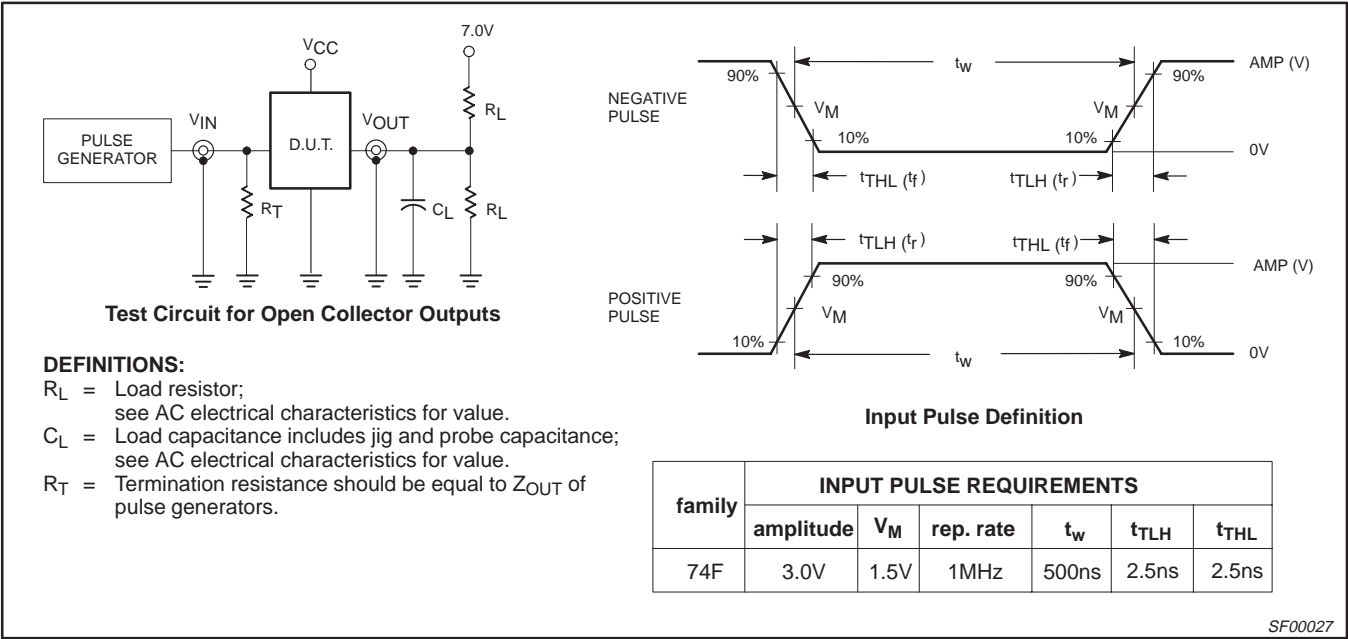
NOTE:

- 1 When using open collector parts, the value of the pull-up resistor greatly affects the value of the  $t_{PLH}$ . For example, changing the specified pull-up resistor value from  $500\Omega$  to  $100\Omega$  will improve the  $t_{PLH}$  up to 50% with only a slight increase in the  $t_{PHL}$ . However, if the value of the pull-up resistor is changed, the user must make certain that the total  $I_{OL}$  current through the resistor and the total  $I_{IL}$ 's of the receivers does not exceed the  $I_{OL}$  minimum specification.

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TEST CIRCUIT AND WAVEFORM

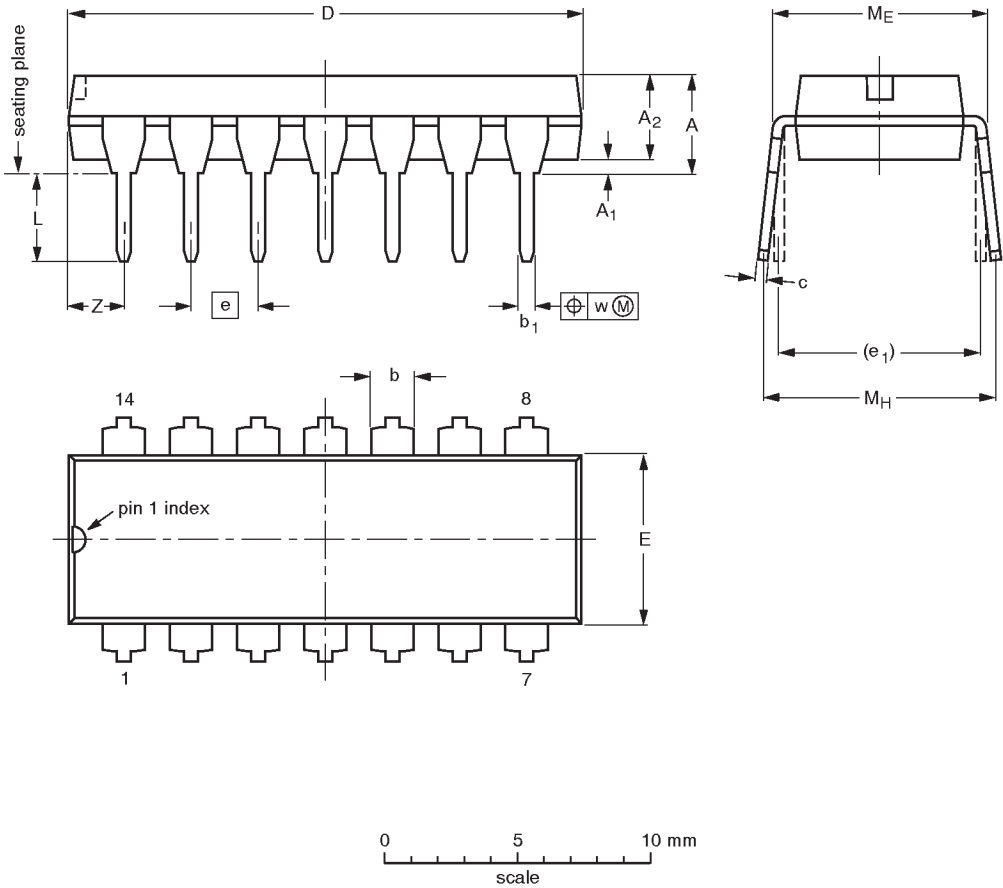


Quad 2-input NAND buffer (open collector)

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

SOT27-1




DIMENSIONS (inch dimensions are derived from the original mm dimensions)

UNIT	A max.	A <sub>1</sub> min.	A <sub>2</sub> max.	b	b <sub>1</sub>	c	D <sup>(1)</sup>	E <sup>(1)</sup>	e	e <sub>1</sub>	L	M <sub>E</sub>	M <sub>H</sub>	w	Z <sup>(1)</sup> max.
mm	4.2	0.51	3.2	1.73 1.13	0.53 0.38	0.36 0.23	19.50 18.55	6.48 6.20	2.54	7.62	3.60 3.05	8.25 7.80	10.0 8.3	0.254	2.2
inches	0.17	0.020	0.13	0.068 0.044	0.021 0.015	0.014 0.009	0.77 0.73	0.26 0.24	0.10	0.30	0.14 0.12	0.32 0.31	0.39 0.33	0.01	0.087

Note

1. Plastic or metal protrusions of 0.25 mm maximum per side are not included.

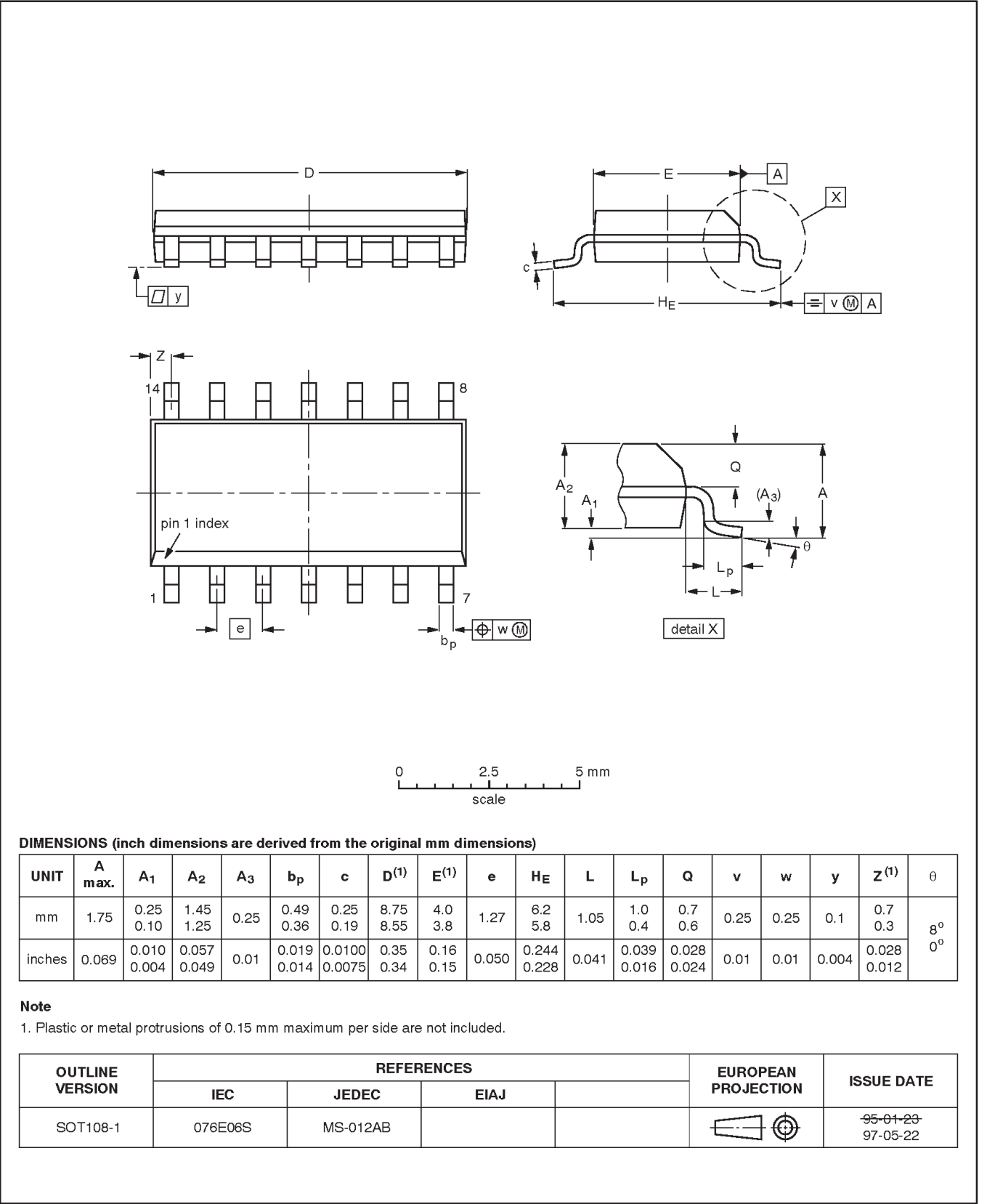
OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT27-1	050G04	MO-001AA				92-11-17 95-03-11

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

SOT108-1



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## Data sheet status

Data sheet status	Product status	Definition [1]
Objective specification	Development	This data sheet contains the design target or goal specifications for product development. Specification may change in any manner without notice.
Preliminary specification	Qualification	This data sheet contains preliminary data, and supplementary data will be published at a later date. Philips Semiconductors reserves the right to make changes at any time without notice in order to improve design and supply the best possible product.
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[1] Please consult the most recently issued datasheet before initiating or completing a design.

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