

DATA SHEET

74F20

Dual 4-input NAND gate

Product specification

1989 Mar 03

IC15 Data Handbook

Dual 4-input NAND gate

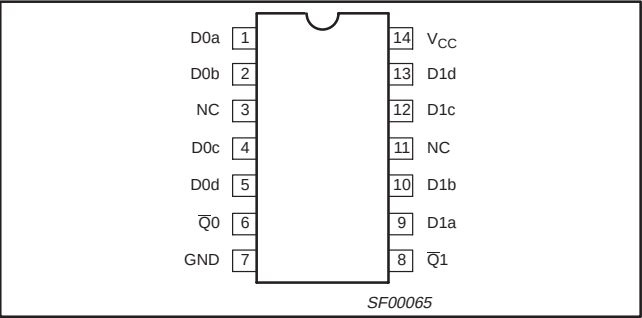
74F20

TYPE	TYPICAL PROPAGATION DELAY	TYPICAL SUPPLY CURRENT (TOTAL)
74F20	3.5ns	2.2mA

ORDERING INFORMATION

DESCRIPTION	COMMERCIAL RANGE $V_{CC} = 5V \pm 10\%$, $T_{amb} = 0^{\circ}C \text{ to } +70^{\circ}C$	PKG DWG #
14-pin plastic DIP	N74F20N	SOT27-1
14-pin plastic SO	N74F20D	SOT108-1

PIN CONFIGURATION

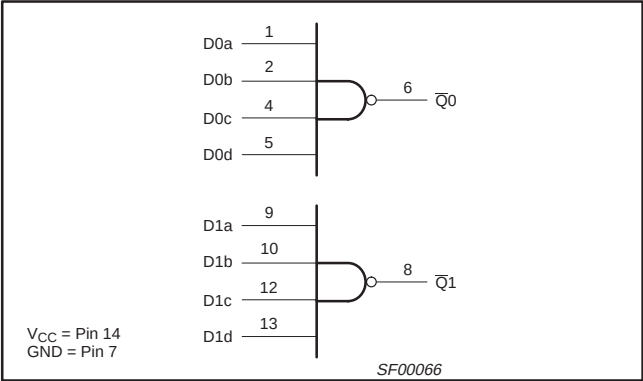


INPUT AND OUTPUT LOADING AND FAN-OUT TABLE

PINS	DESCRIPTION	74F (U.L.) HIGH/LOW	LOAD VALUE HIGH/LOW
Dna, Dnb, Dnc, Dnd	Data inputs	1.0/1.0	20µA/0.6mA
$\overline{Q}0, \overline{Q}1$	Data outputs	50/33	1.0mA/20mA

NOTE: One (1.0) FAST unit load is defined as: 20µA in the High state and 0.6mA in the Low state.

LOGIC DIAGRAM

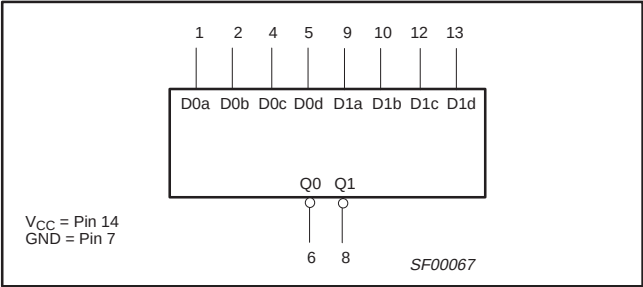


FUNCTION TABLE

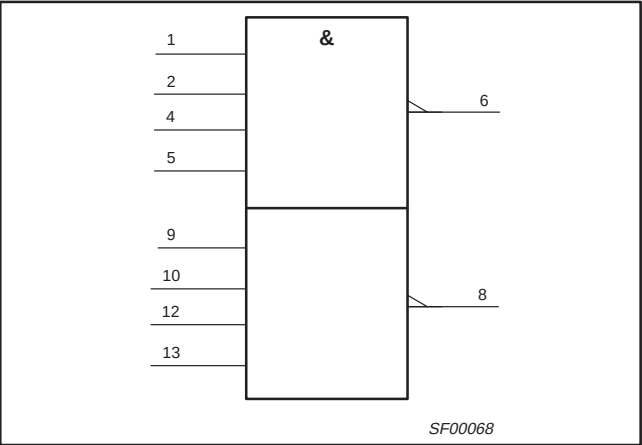
INPUTS				OUTPUT
Dna	Dnb	Dnc	Dnd	$\overline{Q}n$
L	X	X	X	H
X	L	X	X	H
X	X	L	X	H
X	X	X	L	H
H	H	H	H	L

NOTES:
H = High voltage level
L = Low voltage level
X = Don't care

LOGIC SYMBOL



IEC/IEEE SYMBOL



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ABSOLUTE MAXIMUM RATINGS

(Operation beyond the limits 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	40	mA
T_{amb}	Operating free-air temperature range	0 to +70	°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
I_{OH}	High-level output current			−1	mA
I_{OL}	Low-level output current			20	mA
T_{amb}	Operating free-air temperature range	0		+70	°C

DC ELECTRICAL CHARACTERISTICS

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

SYMBOL	PARAMETER	TEST CONDITIONS ¹		LIMITS			UNIT
				MIN	TYP ²	MAX	
V_{OH}	High-level output voltage	$V_{CC} = \text{MIN}, V_{IL} = \text{MAX}$ $V_{IH} = \text{MIN}, I_{OH} = \text{MAX}$	$\pm 10\%V_{CC}$ $\pm 5\%V_{CC}$	2.5 2.7			V
V_{OL}	Low-level output voltage	$V_{CC} = \text{MIN}, V_{IL} = \text{MAX}$ $V_{IH} = \text{MIN}, I_{OL} = \text{MAX}$	$\pm 10\%V_{CC}$ $\pm 5\%V_{CC}$		0.30 0.30	0.50 0.50	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	$V_{CC} = \text{MAX}, V_I = 0.5\text{V}$				−0.6	mA
I_{OS}	Short-circuit output current ³	$V_{CC} = \text{MAX}$		−60		−150	mA
I_{CC}	Supply current (total)	I_{CCH}	$V_{CC} = \text{MAX}$ $V_{IN} = \text{GND}$		0.9	1.4	mA
		I_{CCL}	$V_{IN} = 4.5\text{V}$		3.4	5.1	

NOTES:

- For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions for the applicable type.
- All typical values are at $V_{CC} = 5\text{V}$, $T_{amb} = 25^\circ\text{C}$.
- Not more than one output should be shorted at a time. For testing I_{OS} , the use of high-speed test apparatus and/or sample-and-hold techniques are preferable in order to minimize internal heating and more accurately reflect operational values. Otherwise, prolonged shorting of a High output may raise the chip temperature well above normal and thereby cause invalid readings in other parameter tests. In any sequence of parameter tests, I_{OS} tests should be performed last.

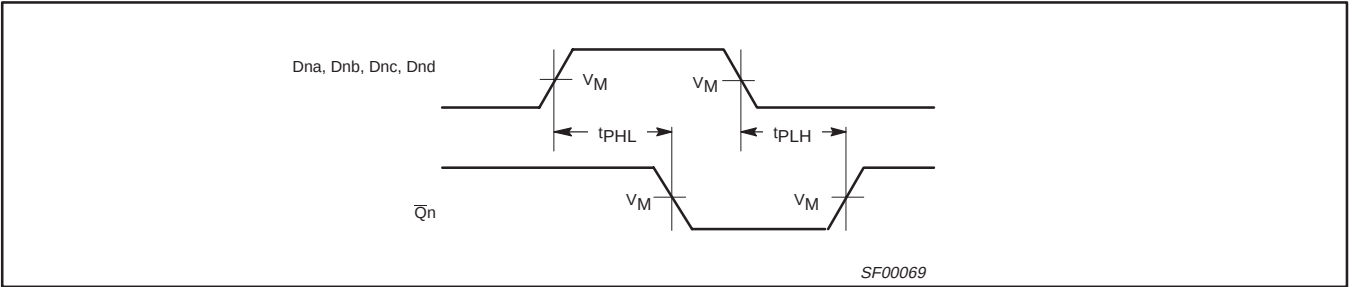
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AC ELECTRICAL CHARACTERISTICS

SYMBOL	PARAMETER	TEST CONDITION	LIMITS					UNIT
			V _{CC} = +5.0V T _{amb} = +25°C C _L = 50pF, R _L = 500Ω			V _{CC} = +5.0V ± 10% T _{amb} = 0°C to +70°C C _L = 50pF, R _L = 500Ω		
			MIN	TYP	MAX	MIN	MAX	
t _{PLH} t _{PHL}	Propagation delay Dna, Dnb, Dnc, Dnd to Q̄n	Waveform 1	2.4 2.0	3.7 3.2	5.0 4.3	2.4 2.0	6.0 5.3	ns

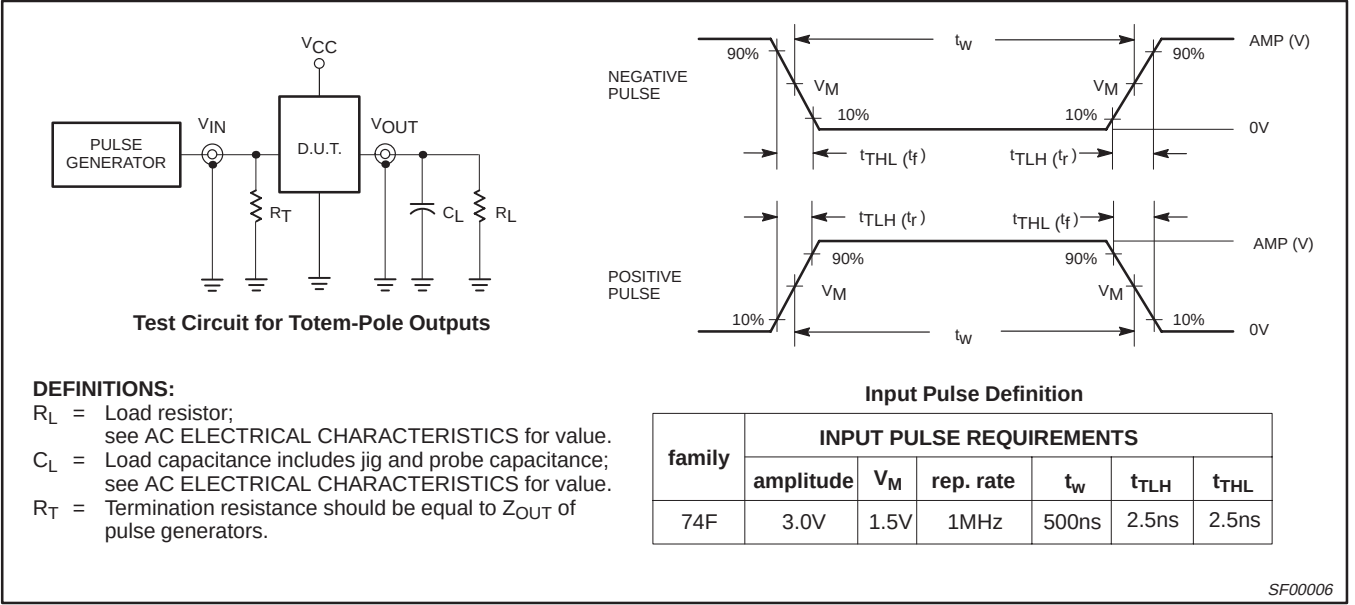
AC WAVEFORMS



Waveform 1. Propagation Delay for Inverting Outputs

NOTE:
For all waveforms, $V_M = 1.5V$.

TEST CIRCUIT AND WAVEFORMS

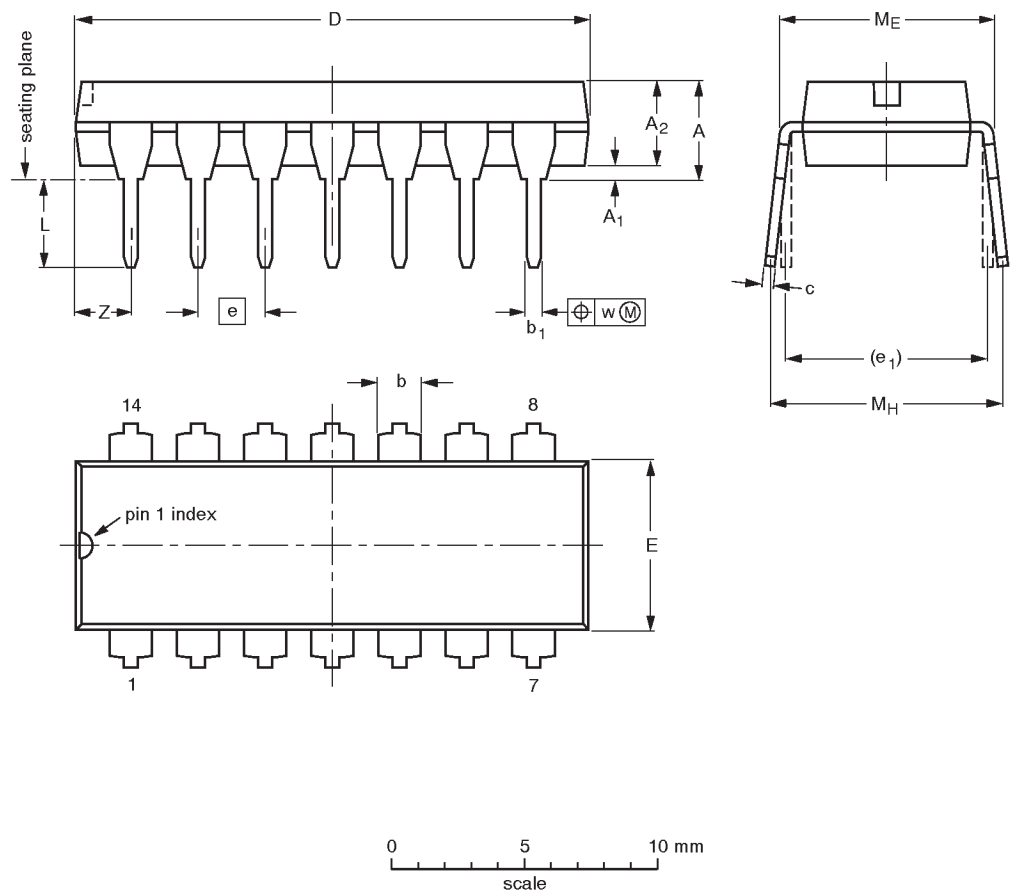


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DIP14: plastic dual in-line package; 14 leads (300 mil)

SOT27-1



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

UNIT	A max.	A ₁ min.	A ₂ max.	b	b ₁	c	D ⁽¹⁾	E ⁽¹⁾	e	e ₁	L	M _E	M _H	w	Z ⁽¹⁾ 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.

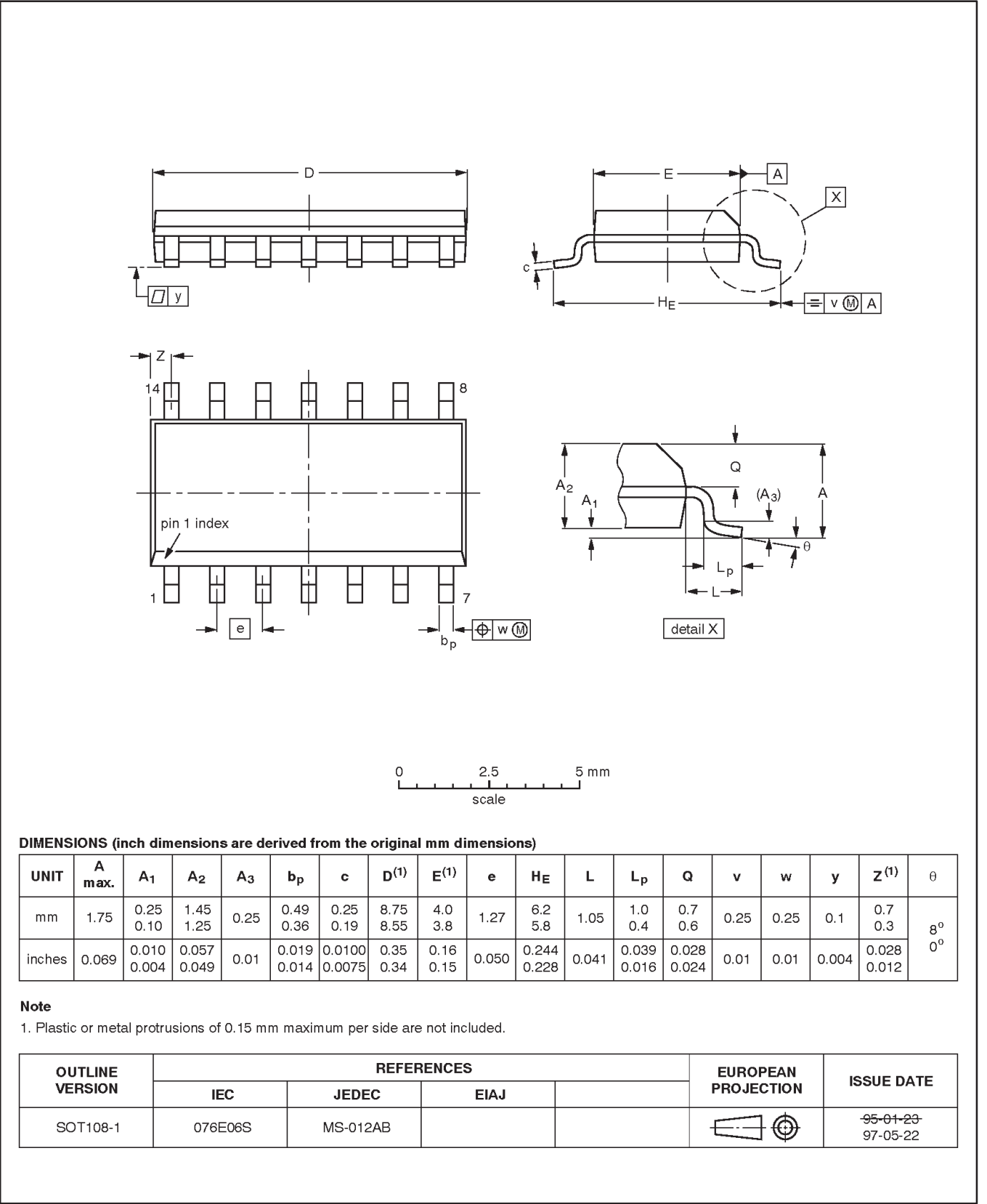
OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT27-1	050G04	MO-001AA				92-11-17 95-03-11

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

SOT108-1



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NOTES

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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.
Product specification	Production	This data sheet contains final specifications. Philips Semiconductors reserves the right to make changes at any time without notice in order to improve design and supply the best possible product.

[1] Please consult the most recently issued datasheet before initiating or completing a design.

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Short-form specification — The data in a short-form specification is extracted from a full data sheet with the same type number and title. For detailed information see the relevant data sheet or data handbook.

Limiting values definition — Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of the specification is not implied. Exposure to limiting values for extended periods may affect device reliability.

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