

Important notice

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If you have any questions related to the data sheet, please contact our nearest sales office via e-mail or telephone (details via salesaddresses@nexperia.com). Thank you for your cooperation and understanding,

Kind regards,

Team Nexperia

DATA SHEET

74F04 Hex inverter

Product specification

1990 Oct 04

IC15 Data Handbook

Hex inverter

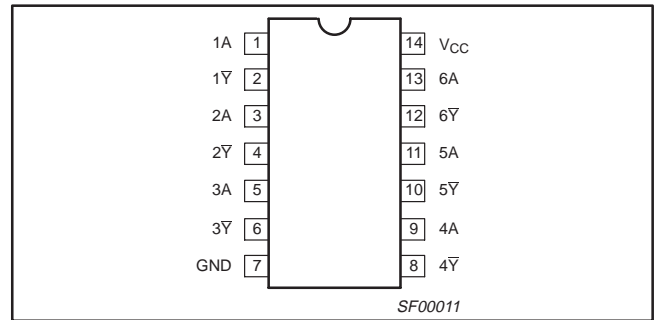
74F04

FEATURE

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

TYPE	TYPICAL PROPAGATION DELAY	TYPICAL SUPPLY CURRENT (TOTAL)
74F04	3.5ns	6.9mA

PIN CONFIGURATION



ORDERING INFORMATION

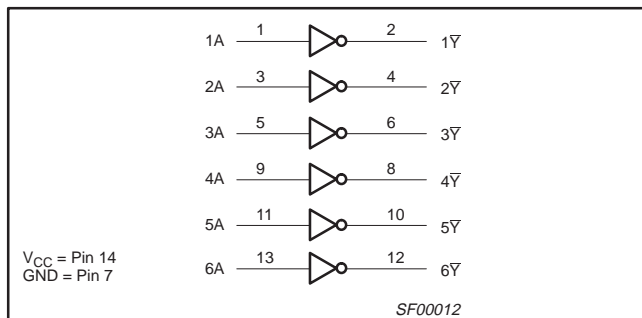
DESCRIPTION	ORDER CODE		PKG DWG #
	COMMERCIAL RANGE $V_{CC} = 5V \pm 10\%$, $T_{amb} = 0^{\circ}C$ to $+70^{\circ}C$	INDUSTRIAL RANGE $V_{CC} = 5V \pm 10\%$, $T_{amb} = -40^{\circ}C$ to $+85^{\circ}C$	
14-pin plastic DIP	N74F04N	I74F04N	SOT27-1
14-pin plastic SO	N74F04D	I74F04D	SOT108-1

INPUT AND OUTPUT LOADING AND FAN OUT TABLE

PINS	DESCRIPTION	74F (U.L.) HIGH/LOW	LOAD VALUE HIGH/LOW
nA	Data inputs	1.0/1.0	20µA/0.6mA
n \bar{Y}	Data output	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

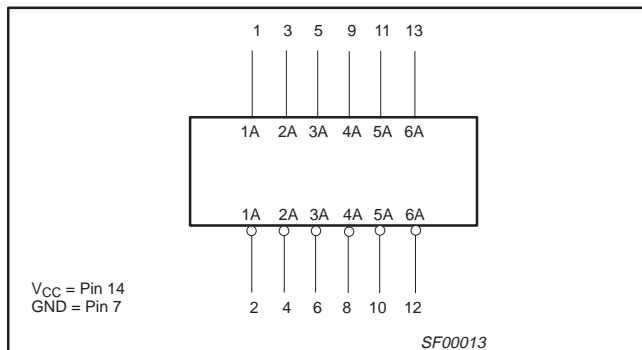


FUNCTION TABLE

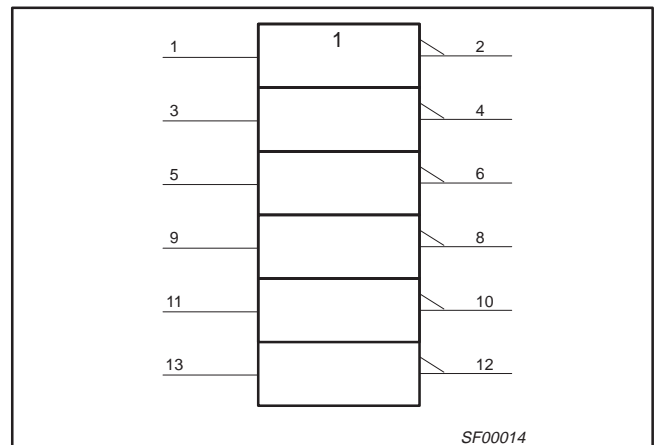
INPUTS	OUTPUT
A	\bar{Y}
L	H
H	L

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

LOGIC SYMBOL



IEC/IEEE SYMBOL



Hex inverter

74F04

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		40	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
I _{OH}	High-level output current			-1	mA
I _{OL}	Low-level output current			20	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 ¹	LIMITS			UNIT	
			MIN	TYP ²	MAX		
V _{OH}	High-level output voltage	V _{CC} = MIN, V _{IL} = MAX	±10%V _{CC}	2.5		V	
		V _{IH} = MIN, I _{OH} = MAX	±5%V _{CC}	2.7	3.4	V	
V _{OL}	Low-level output voltage	V _{CC} = MIN, V _{IL} = MAX	±10%V _{CC}		0.30	0.50	V
		V _{IH} = MIN, I _{OL} = MAX	±5%V _{CC}		0.30	0.50	V
V _{IK}	Input clamp voltage	V _{CC} = MIN, I _I = I _{IK}		-0.73	-1.2	V	
I _I	Input current at maximum input voltage	V _{CC} = MAX, V _I = 7.0V			100	μA	
I _{IH}	High-level input current	V _{CC} = MAX, V _I = 2.7V			20	μA	
I _{IL}	Low-level input current	V _{CC} = MAX, V _I = 0.5V			-0.6	mA	
I _{OS}	Short-circuit output current ³	V _{CC} = MAX	-60		-150	mA	
I _{CC}	Supply current (total)	I _{CCH} V _{CC} = MAX	V _{IN} = GND		2.8	4.2	mA
		I _{CCL} V _{CC} = MAX	V _{IN} = 4.5V		10.2	15.3	mA

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} = 5V, T_{amb} = 25°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.

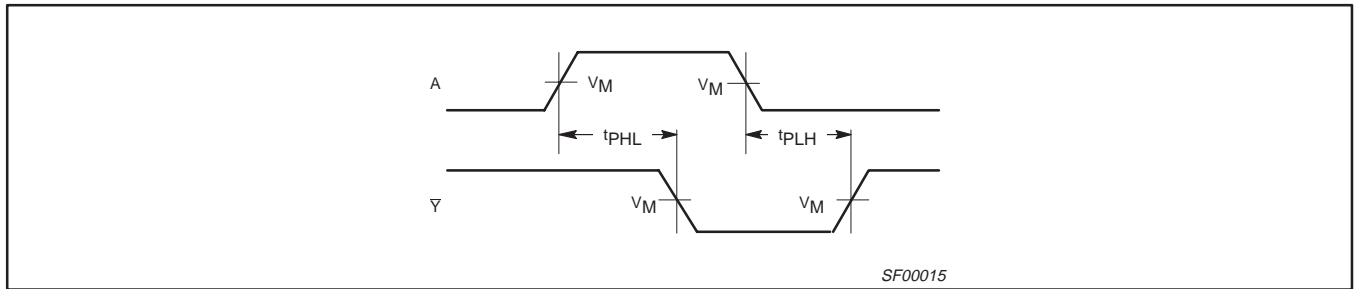
Hex inverter

74F04

AC ELECTRICAL CHARACTERISTICS

SYMBOL	PARAMETER	TEST CONDITION	LIMITS						UNIT	
			$V_{CC} = +5.0V$ $T_{amb} = +25^{\circ}C$ $C_L = 50pF, R_L = 500\Omega$			$V_{CC} = +5.0V \pm 10\%$ $T_{amb} = 0^{\circ}C \text{ to } +70^{\circ}C$ $C_L = 50pF, R_L = 500\Omega$		$V_{CC} = +5.0V \pm 10\%$ $T_{amb} = -40^{\circ}C \text{ to } +85^{\circ}C$ $C_L = 50pF, R_L = 500\Omega$		
			MIN	TYP	MAX	MIN	MAX	MIN		MAX
t_{PLH} t_{PHL}	Propagation delay A to \bar{Y}	Waveform 1	2.4 1.5	3.7 3.2	5.0 4.3	2.4 1.5	6.0 5.3	1.5 1.1	8.0 6.5	ns

AC WAVEFORMS



Waveform 1. Propagation delay for inverting outputs

NOTE:

For all waveforms, $V_M = 1.5V$.

TEST CIRCUIT AND WAVEFORMS

Test Circuit for Totem-Pole Outputs

Input Pulse Definition

DEFINITIONS:

R_L = Load resistor; see AC ELECTRICAL CHARACTERISTICS for value.

C_L = Load capacitance includes jig and probe capacitance; see AC ELECTRICAL CHARACTERISTICS for value.

R_T = Termination resistance should be equal to Z_{OUT} of pulse generators.

family	INPUT PULSE REQUIREMENTS					
	amplitude	V_M	rep. rate	t_w	t_{TLH}	t_{THL}
74F	3.0V	1.5V	1MHz	500ns	2.5ns	2.5ns

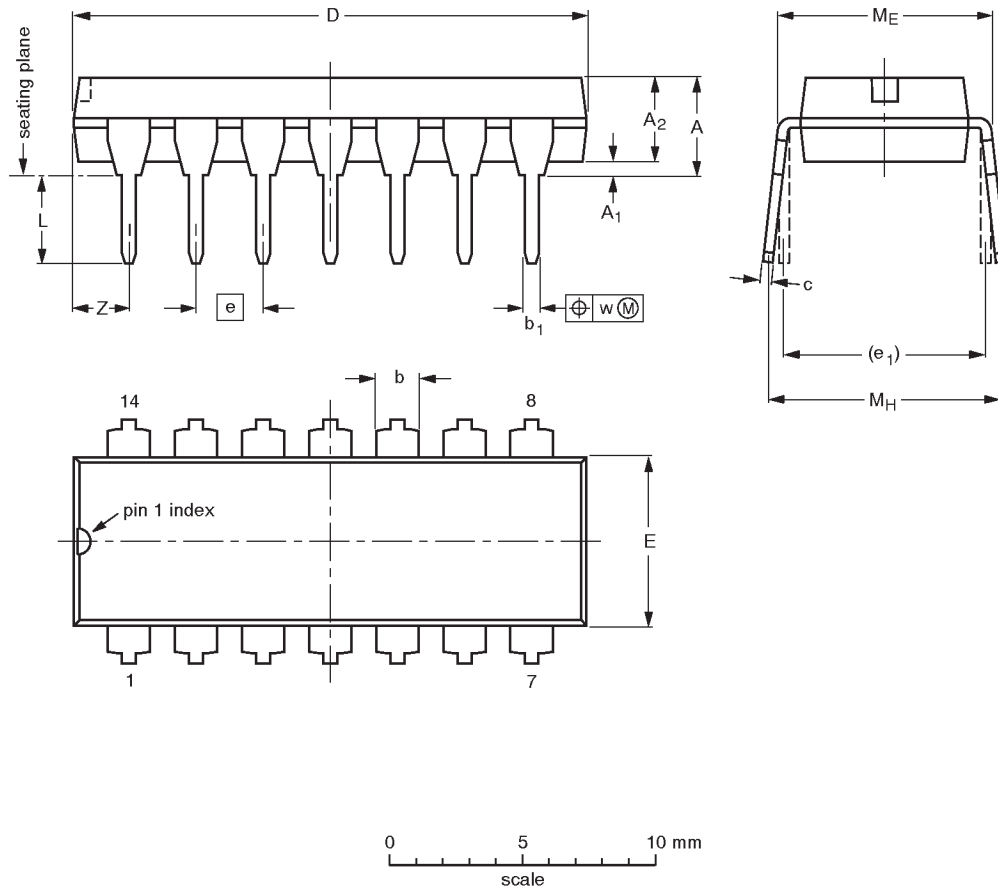
SF00006

Hex inverter

74F04

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.

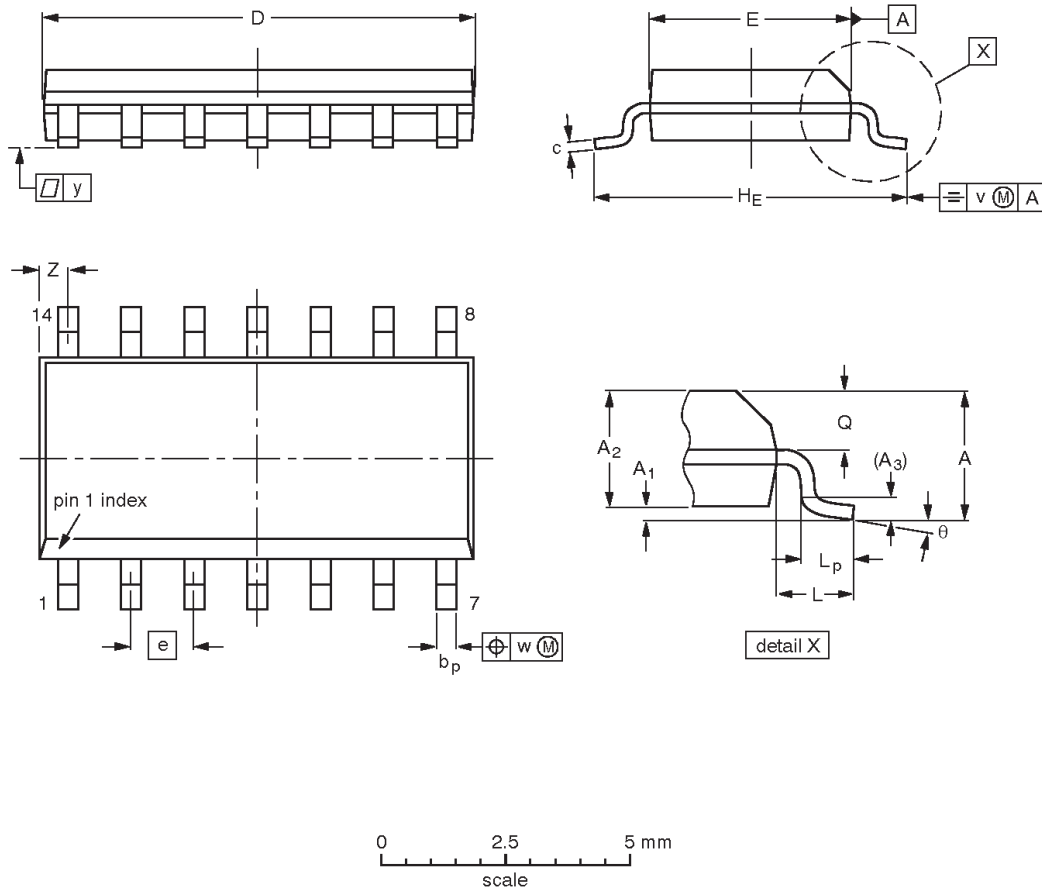
OUTLINE VERSION	REFERENCES			EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ		
SOT27-1	050G04	MO-001AA			92-11-17 95-03-11

Hex inverter

74F04

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

SOT108-1



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

UNIT	A max.	A ₁	A ₂	A ₃	b _p	c	D ⁽¹⁾	E ⁽¹⁾	e	H _E	L	L _p	Q	v	w	y	z ⁽¹⁾	θ
mm	1.75	0.25 0.10	1.45 1.25	0.25	0.49 0.36	0.25 0.19	8.75 8.55	4.0 3.8	1.27	6.2 5.8	1.05	1.0 0.4	0.7 0.6	0.25	0.25	0.1	0.7 0.3	8° 0°
inches	0.069	0.010 0.004	0.057 0.049	0.01	0.019 0.014	0.0100 0.0075	0.35 0.34	0.16 0.15	0.050	0.244 0.228	0.041	0.039 0.016	0.028 0.024	0.01	0.01	0.004	0.028 0.012	

Note

1. Plastic or metal protrusions of 0.15 mm maximum per side are not included.

OUTLINE VERSION	REFERENCES			EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ		
SOT108-1	076E06S	MS-012AB			95-01-29 97-05-22

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NOTES

Hex inverter

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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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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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