# INTEGRATED CIRCUITS

# DATA SHEET

# **74F04**Hex inverter

Product specification

1990 Oct 04

IC15 Data Handbook





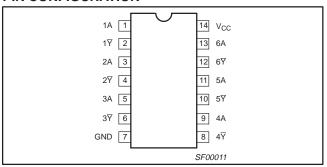
Hex inverter 74F04

#### **FEATURE**

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

	ГҮРЕ	TYPICAL PROPAGATION DELAY	TYPICAL SUPPLY CURRENT ( TOTAL)
7	74F04	3.5ns	6.9mA

#### **PIN CONFIGURATION**



#### **ORDERING INFORMATION**

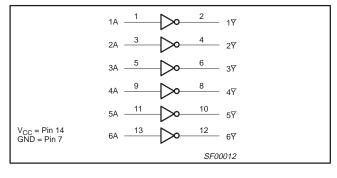
	C	ORDER CODE	
DESCRIPTION	COMMERCIAL RANGE $V_{CC} = 5V \pm 10\%$ , $T_{amb} = 0^{\circ}C$ to +70°C	INDUSTRIAL RANGE $V_{CC}$ = 5V ±10%, $T_{amb}$ = -40°C to +85°C	PKG DWG #
14-pin plastic DIP	N74F04N	I74F04N	SOT27-1
14-pin plastic SO	N74F04D	I74F04D	SOT108-1

#### 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₹	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**



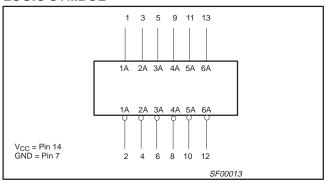
#### **FUNCTION TABLE**

INPUTS	OUTPUT
A	Y
L	Н
Н	L

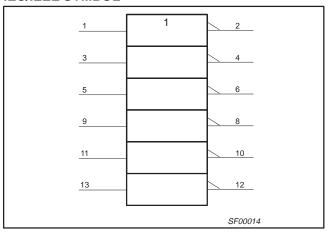
#### NOTES:

H = High voltage level L = Low voltage level

#### **LOGIC SYMBOL**



#### **IEC/IEEE SYMBOL**



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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 <sub>CC</sub>	Supply voltage		-0.5 to +7.0	V
V <sub>IN</sub>	Input voltage		-0.5 to +7.0	V
I <sub>IN</sub>	Input current		−30 to +5	mA
V <sub>OUT</sub>	Voltage applied to output in high output state	−0.5 to V <sub>CC</sub>	V	
I <sub>OUT</sub>	Current applied to output in low output state		40	mA
T <sub>amb</sub>	Operating free air temperature range	Commercial range	0 to +70	°C
		Industrial range	-40 to +85	°C
T <sub>stq</sub>	Storage temperature range		-65 to +150	°C

#### RECOMMENDED OPERATING CONDITIONS

SYMBOL	PARAMETER			LIMITS		UNIT
			MIN	NOM	MAX	
V <sub>CC</sub>	Supply voltage		4.5	5.0	5.5	V
V <sub>IH</sub>	High-level input voltage		2.0			V
V <sub>IL</sub>	Low-level input voltage			0.8	V	
I <sub>lk</sub>	Input clamp current				-18	mA
I <sub>OH</sub>	High-level output current				-1	mA
I <sub>OL</sub>	Low-level output current				20	mA
T <sub>amb</sub>	Operating free air temperature range	Commercial range	0		+70	°C
		-40		+85	°C	

#### DC ELECTRICAL CHARACTERISTICS

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

SYMBOL	PARAMETER		TEST CONDITIO	NS <sup>1</sup>		LIMITS	·	UNIT	
					MIN	TYP <sup>2</sup>	MAX	1	
V <sub>OH</sub>	High-level output voltage		$V_{CC} = MIN, V_{IL} = MAX$	±10%V <sub>CC</sub>	2.5			V	
			V <sub>IH</sub> = MIN, I <sub>OH</sub> = MAX	±5%V <sub>CC</sub>	2.7	3.4		V	
V <sub>OL</sub>	Low-level output voltage		$V_{CC} = MIN, V_{IL} = MAX$	±10%V <sub>CC</sub>		0.30	0.50	V	
			$V_{IH} = MIN, I_{OI} = MAX$	±5%V <sub>CC</sub>		0.30	0.50	V	
V <sub>IK</sub>	Input clamp voltage		$V_{CC} = MIN, I_I = I_{IK}$		-0.73	-1.2	V		
I <sub>I</sub>	Input current at maximum voltage	input	$V_{CC} = MAX, V_I = 7.0V$				100	μΑ	
I <sub>IH</sub>	High-level input current		$V_{CC} = MAX, V_I = 2.7V$				20	μΑ	
I <sub>IL</sub>	Low-level input current		$V_{CC} = MAX, V_I = 0.5V$				-0.6	mA	
los	Short-circuit output currer	ıt <sup>3</sup>	$V_{CC} = MAX$		-60		-150	mA	
I <sub>CC</sub>	Supply current (total)	I <sub>CCH</sub>	V <sub>CC</sub> = MAX	V <sub>IN</sub> = GND		2.8	4.2	mA	
		I <sub>CCL</sub>	$V_{CC} = MAX$	V <sub>IN</sub> = 4.5V		10.2	15.3	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  $V_{CC} = 5V$ ,  $T_{amb} = 25^{\circ}C$ .

October 4, 1990

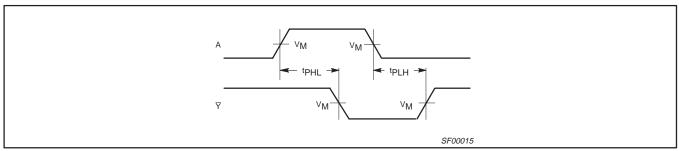
<sup>3.</sup> Not more than one output should be shorted at a time. For testing I<sub>OS</sub>, the use of high-speed test apparatus and/or sample-and-hold techniques are preferable in order to minimize internal heating and more accurately reflect operational values. Otherwise, prolonged shorting of 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<sub>OS</sub> tests should be performed last.

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#### **AC ELECTRICAL CHARACTERISTICS**

	PARAMETER	TEST CONDITION		LIMITS							
SYMBOL			$V_{CC}$ = +5.0V $T_{amb}$ = +25°C $C_L$ = 50pF, $R_L$ = 500Ω			T <sub>amb</sub> = 0°0	0V ± 10% C to +70°C R <sub>L</sub> = 500Ω	$V_{CC} = +5.$ $T_{amb} = -40^{\circ}$ $C_{L} = 50 pF$	UNIT		
			MIN	TYP	MAX	MIN	MAX	MIN	MAX		
t <sub>PLH</sub>	Propagation delay A to $\overline{Y}$	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**

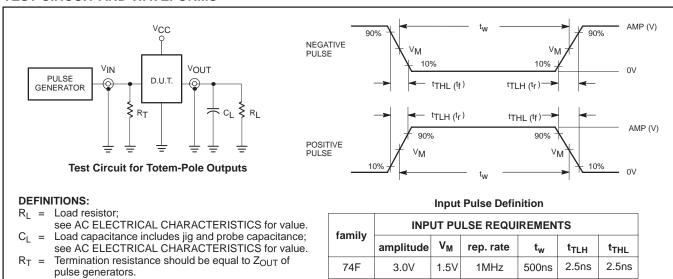


Waveform 1. Propagation delay for inverting outputs

#### NOTE:

For all waveforms,  $V_M = 1.5V$ .

# **TEST CIRCUIT AND WAVEFORMS**

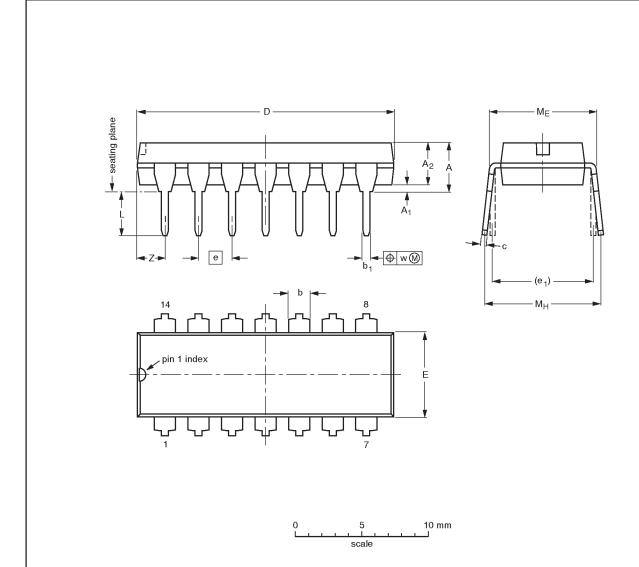


SF00006

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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>	С	D <sup>(1)</sup>	E <sup>(1)</sup>	е	e <sub>1</sub>	L	ME	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.

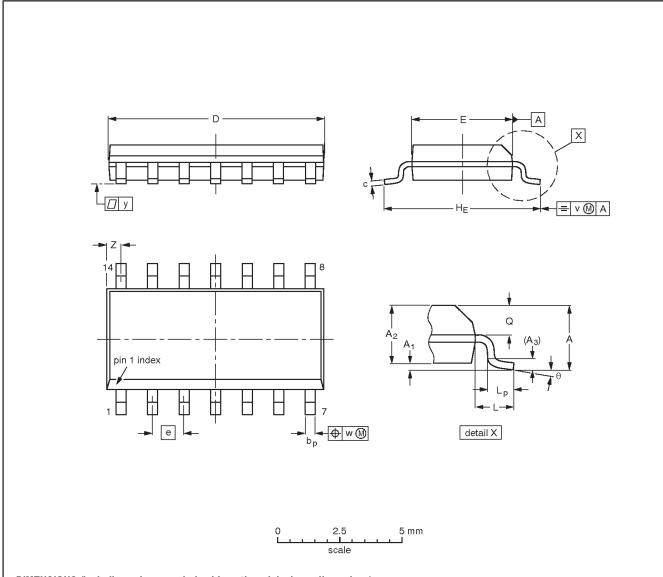
OUTLINE		REFER		EUROPEAN	ISSUE DATE	
VERSION	IEC	JEDEC	PROJECTION	ISSUE DATE		
SOT27-1	050G04	MO-001AA				<del>92-11-17</del> 95-03-11

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## 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 <sub>1</sub>	A <sub>2</sub>	А3	bp	С	D <sup>(1)</sup>	E <sup>(1)</sup>	е	HE	L	Lp	Q	v	w	У	Z <sup>(1)</sup>	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°
inches	0.069	0.010 0.004	0.057 0.049	0.01		0.0100 0.0075	0.35 0.34	0.16 0.15	0.050	0.244 0.228	0.041	0.039 0.016		0.01	0.01	0.004	0.028 0.012	0°

#### Note

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

OUTLINE		REFER	EUROPEAN	ISSUE DATE	
VERSION	IEC	JEDEC	EIAJ	PROJECTION	ISSUE DATE
SOT108-1	076E06S	MS-012AB			<del>95-01-23</del> 97-05-22

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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.
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