

# DATA SHEET

**74F10** Triple 3-input NAND gate  
**74F11** Triple 3-input AND gate

Product specification

1989 Sep 20

IC15 Data Handbook

# Gates

# 74F10, 74F11

74F10 Triple 3-input NAND gate

74F11 Triple 3-input AND gate

TYPE	TYPICAL PROPAGATION DELAY	TYPICAL SUPPLY CURRENT (TOTAL)
74F10	3.5ns	3.3mA
74F11	4.2ns	5.3mA

### ORDERING INFORMATION

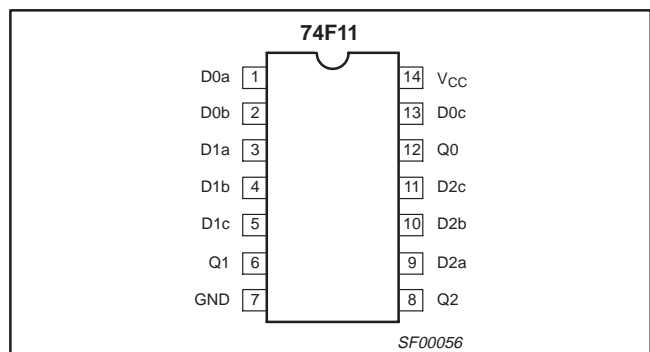
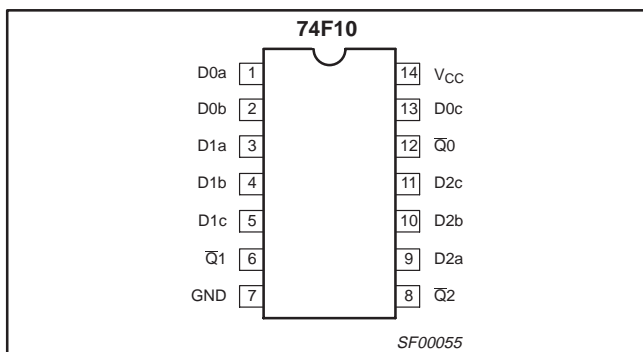
DESCRIPTION	COMMERCIAL RANGE $V_{CC} = 5V \pm 10\%$ , $T_{amb} = 0^{\circ}C \text{ to } +70^{\circ}C$	PKG DWG #
14-pin plastic DIP	N74F10N, N74F11N	SOT27-1
14-pin plastic SO	N74F10D, N74F11D	SOT108-1

### INPUT AND OUTPUT LOADING AND FAN OUT TABLE

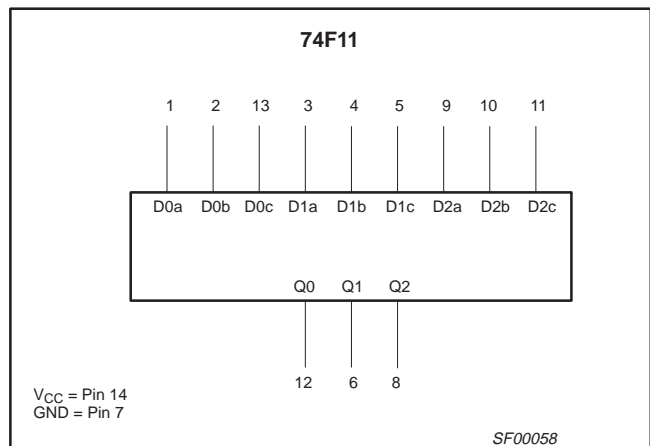
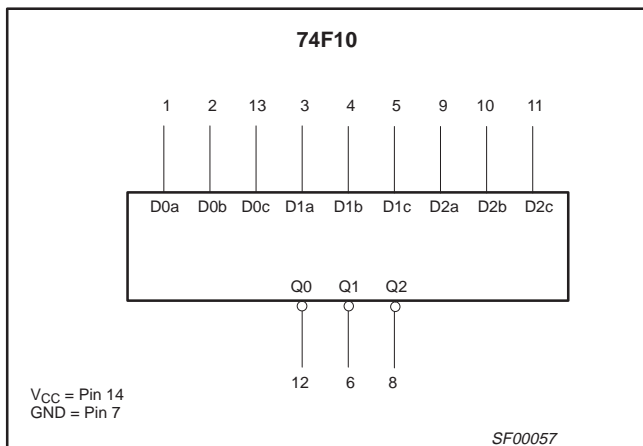
PINS	DESCRIPTION	74F (U.L.) HIGH/LOW	LOAD VALUE HIGH/LOW
Dna, Dnb, Dnc	Data inputs	1.0/1.0	20 $\mu$ A/0.6mA
$\bar{Q}_n$	Data output (74F10)	50/33	1.0mA/20mA
Qn	Data output (74F11)	50/33	1.0mA/20mA

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

### PIN CONFIGURATIONS



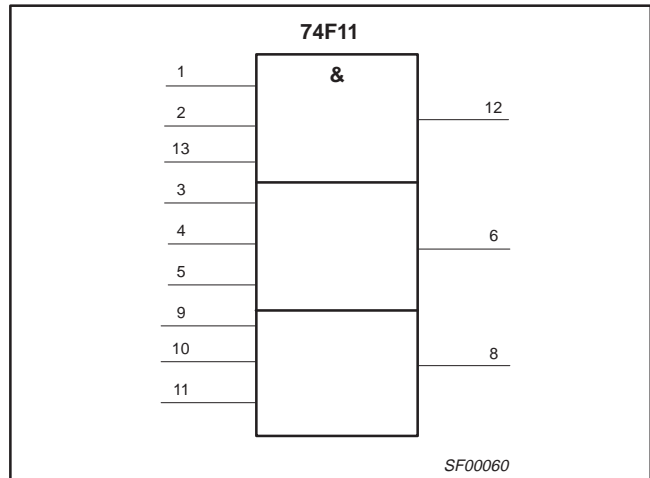
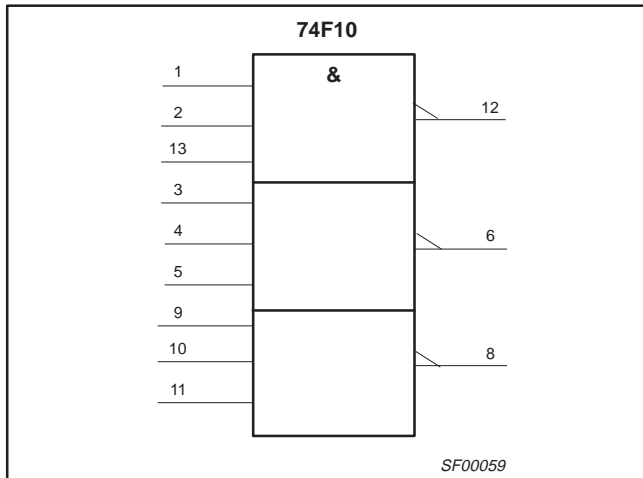
### LOGIC SYMBOLS



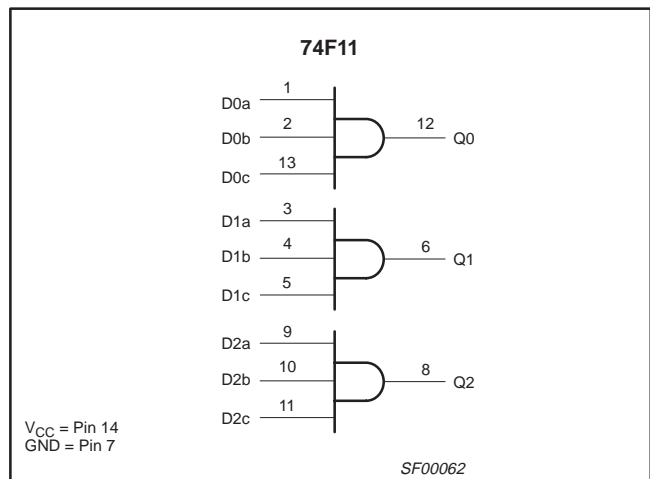
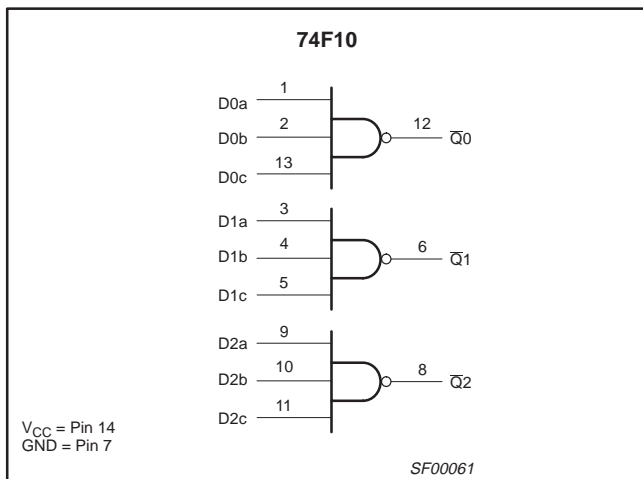
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IEC/IEEE SYMBOLS



LOGIC DIAGRAMS



FUNCTION TABLE

INPUTS			OUTPUTS	
			74F10	74F11
Dna	Dnb	Dnc	$\bar{Q}_n$	Qn
L	L	L	H	L
L	L	H	H	L
L	H	L	H	L
L	H	H	H	L
H	L	L	H	L
H	L	H	H	L
H	H	L	H	L
H	H	H	L	H

NOTES:

1. H = High voltage level
2. L = Low voltage level

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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	0 to +70	°C
T <sub>stg</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>IK</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	0		+70	°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				
V <sub>OH</sub>	High-level output voltage	V <sub>CC</sub> = MIN, V <sub>IL</sub> = 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 <sub>OL</sub>	Low-level output voltage	V <sub>CC</sub> = MIN, V <sub>IL</sub> = MAX	±10%V <sub>CC</sub>		0.35	V			
		V <sub>IH</sub> = MIN, I <sub>OI</sub> = MAX	±5%V <sub>CC</sub>		0.35				
V <sub>IK</sub>	Input clamp voltage	V <sub>CC</sub> = MIN, I <sub>I</sub> = I <sub>IK</sub>			-0.73	V			
I <sub>I</sub>	Input current at maximum input voltage	V <sub>CC</sub> = MAX, V <sub>I</sub> = 7.0V			100	μA			
I <sub>IH</sub>	High-level input current	V <sub>CC</sub> = MAX, V <sub>I</sub> = 2.7V			20	μA			
I <sub>IL</sub>	Low-level input current	V <sub>CC</sub> = MAX, V <sub>I</sub> = 0.5V			-0.6	mA			
I <sub>OS</sub>	Short-circuit output current <sup>3</sup>	V <sub>CC</sub> = MAX		-60		mA			
I <sub>CC</sub>	Supply current (total)	74F10	I <sub>CCH</sub>	V <sub>CC</sub> = MAX	V <sub>IN</sub> = GND	1.8	2.1	mA	
			I <sub>CCL</sub>	V <sub>IN</sub> = 4.5V		6.0	7.7		
		74F11	I <sub>CCH</sub>	V <sub>CC</sub> = MAX	V <sub>IN</sub> = 4.5V		4.7	6.2	mA
			I <sub>CCL</sub>	V <sub>CC</sub> = MAX	V <sub>IN</sub> = GND		7.2	9.7	

**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<sub>CC</sub> = 5V, T<sub>amb</sub> = 25°C.
- 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.

# Gates

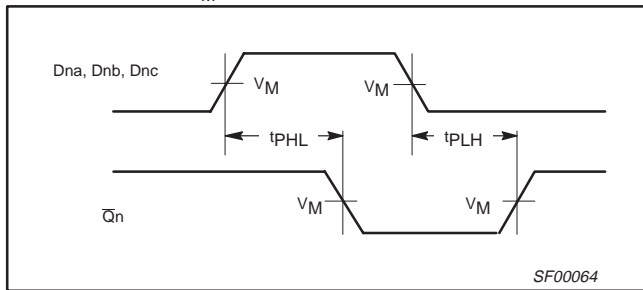
# 74F10, 74F11

## AC ELECTRICAL CHARACTERISTICS

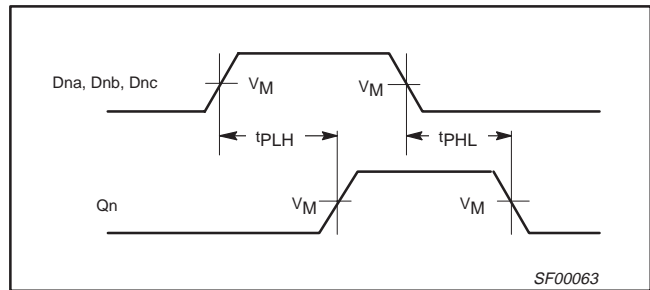
SYMBOL	PARAMETER	TEST CONDITION	LIMITS					UNIT	
			$V_{CC} = +5.0V$ $T_{amb} = +25^{\circ}C$ $C_L = 50pF, R_L = 500\Omega$			$V_{CC} = +5.0V \pm 10%$ $T_{amb} = 0^{\circ}C \text{ to } +70^{\circ}C$ $C_L = 50pF, R_L = 500\Omega$			
			MIN	TYP	MAX	MIN	MAX		
$t_{PLH}$ $t_{PHL}$	Propagation delay Dna, Dnb, Dnc to $\bar{Q}_n$	74F10	Waveform 1	2.4 1.5	3.7 3.2	5.0 4.3	2.4 1.5	6.0 5.3	ns
$t_{PLH}$ $t_{PHL}$	Propagation delay Dna, Dnb, Dnc to $Q_n$	74F11	Waveform 2	3.0 2.5	4.2 4.1	5.6 5.5	3.0 2.5	6.6 6.5	ns

## AC WAVEFORMS

For all waveforms,  $V_M = 1.5V$ .



Waveform 1. Propagation Delay for Inverting Outputs (74F10)



Waveform 2. Propagation Delay for Non-Inverting Outputs (74F11)

## TEST CIRCUIT AND WAVEFORM

**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

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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



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

UNIT	A max.	A <sub>1</sub>	A <sub>2</sub>	A <sub>3</sub>	b <sub>p</sub>	c	D <sup>(1)</sup>	E <sup>(1)</sup>	e	H <sub>E</sub>	L	L <sub>p</sub>	Q	v	w	y	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° 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

## Gates

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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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**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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