



**THE DATASHEET OF  
N74F51D,602**



# DATA SHEET

## **74F51**

Dual 2-wide 2-input, 2-wise 3-input  
AND-OR-invert gate

Product specification

1989 Mar 03

IC15 Data Handbook

# Dual 2-wide 2-input, 2-wide 3-input AND-OR-invert gate

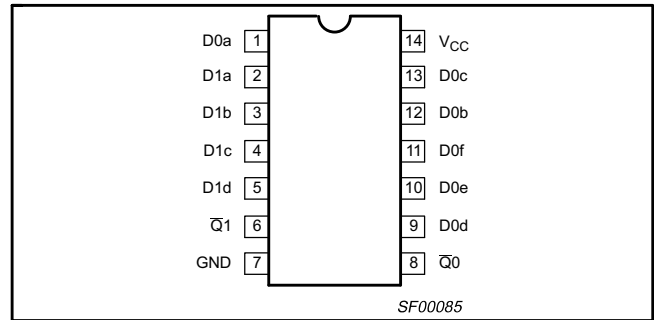
# 74F51

TYPE	TYPICAL PROPAGATION DELAY	TYPICAL SUPPLY CURRENT (TOTAL)
74F51	3.0ns	3.5mA

### 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	N74F51N	SOT27-1
14-pin plastic SO	N74F51D	SOT108-1

### PIN CONFIGURATION

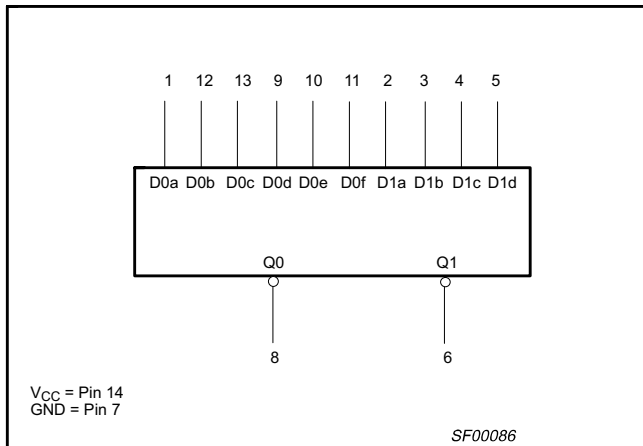


### INPUT AND OUTPUT LOADING AND FAN-OUT TABLE

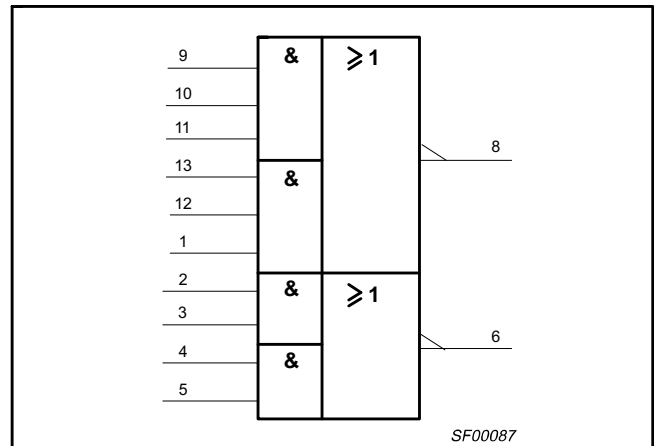
PINS	DESCRIPTION	74F (U.L.) HIGH/LOW	LOAD VALUE HIGH/LOW
Dna, Dnb, Dnc, Dnd, Dne, Dnf	Data inputs	1.0/1.0	20 $\mu$ A/0.6mA
$\bar{Q}0, \bar{Q}1$	Data outputs	50/33	1.0mA/20mA

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

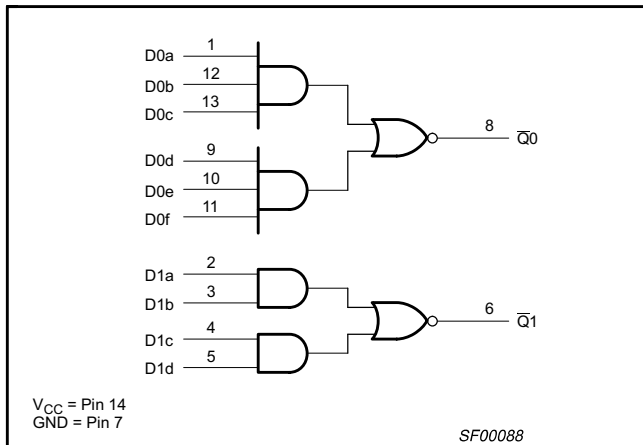
### LOGIC SYMBOL



### IEC/IEEE SYMBOL



### LOGIC DIAGRAM



### FUNCTION TABLE FOR 3-INPUT GATES

INPUTS						OUTPUT
D0a	D0b	D0c	D0d	D0e	D0f	$\bar{Q}0$
H	H	H	X	X	X	L
X	X	X	H	H	H	L
All other combinations						H

**NOTES:**

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

### FUNCTION TABLE FOR 2-INPUT GATES

INPUTS				OUTPUT
D1a	D1b	D1c	D1d	$\bar{Q}1$
H	H	X	X	L
X	X	H	H	L
All other combinations				H

**NOTES:**

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

## Dual 2-wide 2-input, 2-wide 3-input AND-OR-invert gate

74F51

**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 <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	
V <sub>OL</sub>	Low-level output voltage	V <sub>CC</sub> = MIN, V <sub>IL</sub> = MAX	±10%V <sub>CC</sub>		0.30	0.50	V
		V <sub>IH</sub> = MIN, I <sub>OL</sub> = MAX	±5%V <sub>CC</sub>		0.30	0.50	V
V <sub>IK</sub>	Input clamp voltage	V <sub>CC</sub> = MIN, I <sub>I</sub> = I <sub>IK</sub>			-0.73	-1.2	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		-150	mA
I <sub>CC</sub>	Supply current (total)	V <sub>CC</sub> = MAX	V <sub>IN</sub> = GND		1.8	3.0	mA
					5.5	7.5	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<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.

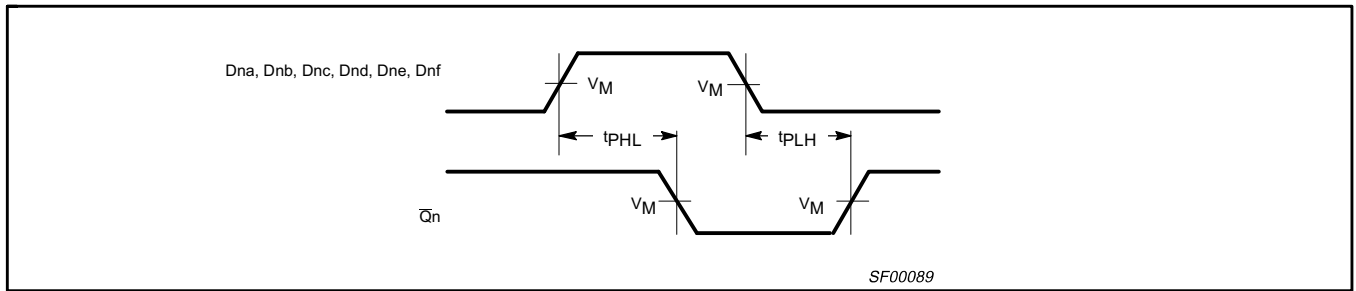
# Dual 2-wide 2-input, 2-wide 3-input AND-OR-invert gate

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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		
			MIN	TYP	MAX	MIN	MAX	
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation delay Dna, Dnb, Dnc, Dnd, Dne, Dnf to $\bar{Q}_n$	Waveform 1	2.0 1.0	3.5 2.5	5.5 4.0	1.5 1.0	6.5 4.5	ns

## AC WAVEFORMS



Waveform 1. Propagation Delay for Inverting Outputs

**NOTE:**

For all waveforms, V<sub>M</sub> = 1.5V.

## TEST CIRCUIT AND WAVEFORM

**Test Circuit for Totem-Pole Outputs**

**Input Pulse Definition**

**DEFINITIONS:**  
 R<sub>L</sub> = Load resistor; see AC ELECTRICAL CHARACTERISTICS for value.  
 C<sub>L</sub> = Load capacitance includes jig and probe capacitance; see AC ELECTRICAL CHARACTERISTICS for value.  
 R<sub>T</sub> = Termination resistance should be equal to Z<sub>OUT</sub> of pulse generators.

family	INPUT PULSE REQUIREMENTS					
	amplitude	V <sub>M</sub>	rep. rate	t <sub>w</sub>	t <sub>TLH</sub>	t <sub>THL</sub>
74F	3.0V	1.5V	1MHz	500ns	2.5ns	2.5ns

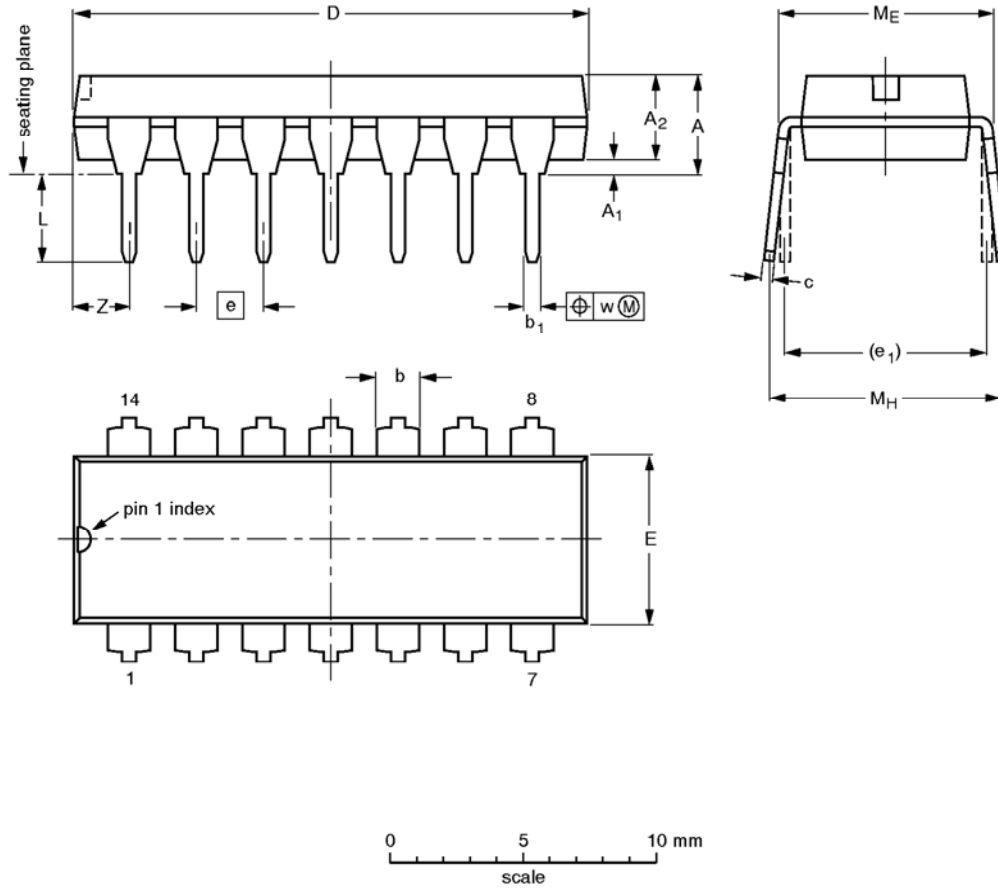
SF00006

# Dual 2-wide 2-input, 2-wise 3-input AND-OR-invert gate

74F51

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.

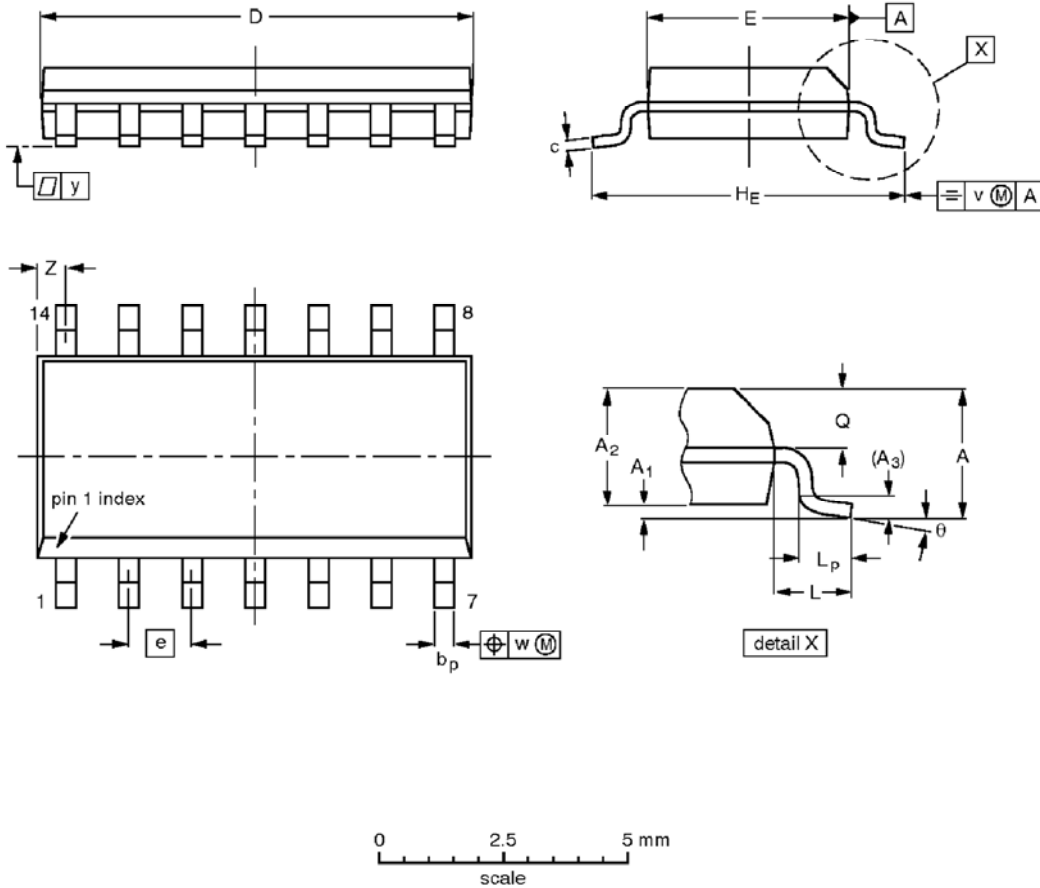
OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT27-1	050G04	MO-001AA				92-11-17 95-03-11

Dual 2-wide 2-input, 2-wise 3-input AND-OR-invert gate

74F51

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			<del>95-01-29</del> 97-05-22

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Dual 2-wide 2-input, 2-wise 3-input AND-OR-invert gate

74F51

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**NOTES**

## Dual 2-wide 2-input, 2-wise 3-input AND-OR-invert gate

74F51

**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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