

13-input NAND Gate

FAST 74F133

FAST Products

PRODUCT SPECIFICATION

TYPE	TYPICAL PROPAGATION DELAY	TYPICAL SUPPLY CURRENT (TOTAL)
74F133	4.0ns	2.0 mA

ORDERING INFORMATION

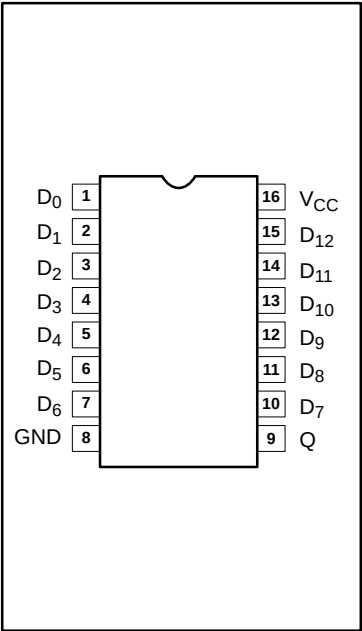
DESCRIPTION	ORDER CODE	
	COMMERCIAL RANGE $V_{CC} = 5V \pm 10\%$, $T_{amb} = 0^{\circ}C$ to $+70^{\circ}C$	INDUSTRIAL RANGE $V_{CC} = 5V \pm 10\%$, $T_{amb} = -40^{\circ}C$ to $+85^{\circ}C$
16-pin plastic DIP	N74F133N	I74F133N
16-pin plastic SO	N74F133D	I74F133D

INPUT AND OUTPUT LOADNG AND FAN OUT TABLE

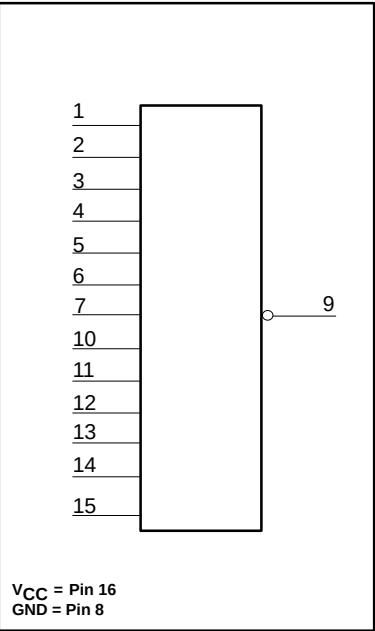
PINS	DESCRIPTION	74F (U.L.) HIGH/LOW	LOAD VALUE HIGH/LOW
$D_0 - D_{12}$	Data inputs	1.0/1.0	20μA/0.6mA
$\overline{Q}$	Data output	50/33	1.0mA/20mA

Note to input and output loading and fan out table
1. One (1.0) FAST unit load is defined as: 20μA in the high state and 0.6mA in the low state.

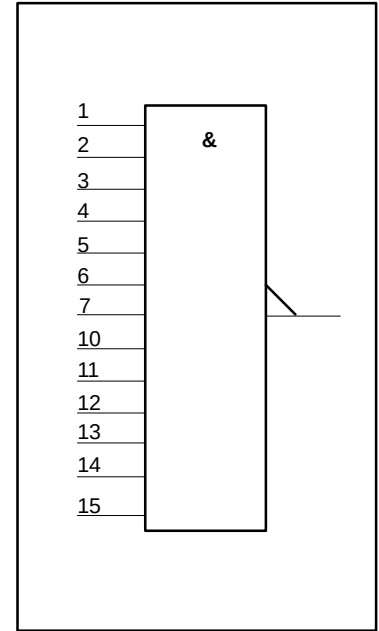
PIN CONFIGURATION



LOGIC SYMBOL



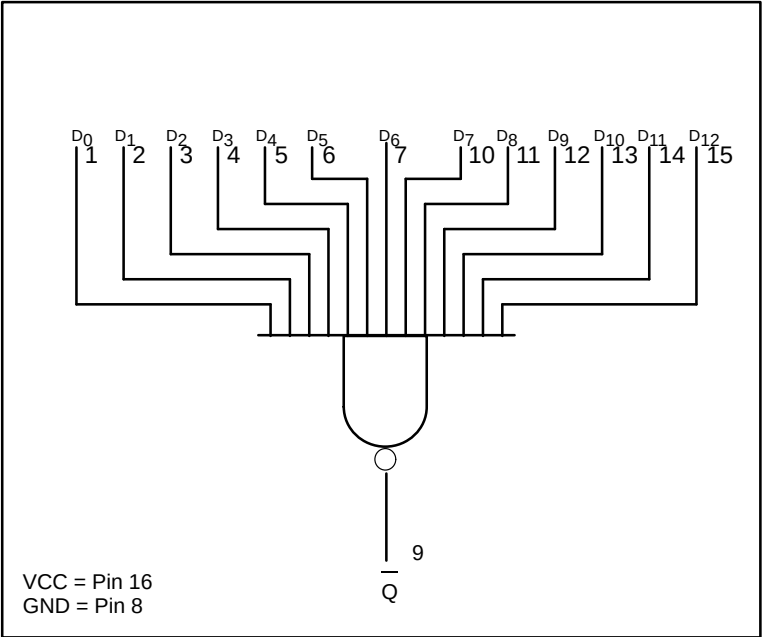
LOGIC SYMBOL (IEEE/IEC)



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LOGIC DIAGRAM



FUNCTION TABLE

INPUTS													OUTPUT
D0	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	D11	D12	$\overline{Q}$
H	H	H	H	H	H	H	H	H	H	H	H	H	L
Any one input = L													H

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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_{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}		0.35	0.50	V
			V _{IH} = MIN, I _{OI} = MAX	±5%V _{CC}		0.35	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			1.0	2.0	mA
		I _{CCL}	V _{CC} = MAX			2.5	4.0	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 $V_{CC} = 5\text{V}$, $T_{amb} = 25^\circ\text{C}$.
- 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.

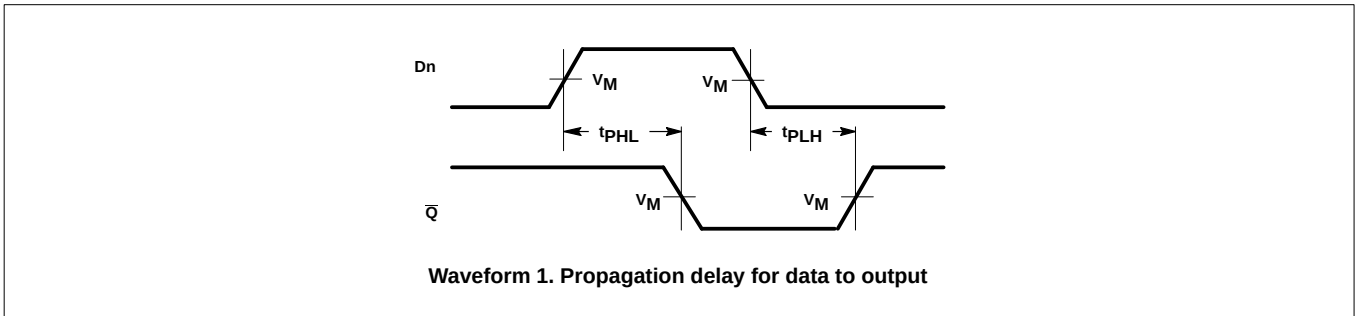
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AC ELECTRICAL CHARACTERISTICS

SYMBOL	PARAMETER	TEST CONDITION	LIMITS								UNIT
			T _{amb} = +25°C			T _{amb} = 0°C to +70°C		T _{amb} = -40°C to +85°C			
			V _{CC} = +5.0V C _L = 50pF, R _L = 500Ω			V _{CC} = +5.0V ± 10% C _L = 50pF, R _L = 500Ω		V _{CC} = +5.0V ± 10% C _L = 50pF, R _L = 500Ω			
			MIN	TYP	MAX	MIN	MAX	MIN	MAX		
t _{PLH} t _{PHL}	Propagation delay Dn to Qn	Waveform 1	2.0 2.5	4.0 4.5	7.0 7.5	1.5 2.0	7.5 8.0	1.5 2.0	7.5 8.0	ns	

AC WAVEFORMS



Note to AC Waveforms
1. For all waveforms, VM = 1.5V.

TEST CIRCUIT AND WAVEFORMS

