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Status	Product Specification
FAST Products	

FAST 74F133

Gate

13-Input NAND Gate

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

ORDERING INFORMATION

PACKAGES	COMMERCIAL RANGE $V_{CC} = 5V \pm 10\%$; $T_A = 0^\circ C$ to $+70^\circ C$
14-Pin Plastic DIP	N74F133N
14-Pin Plastic SO	N74F133D

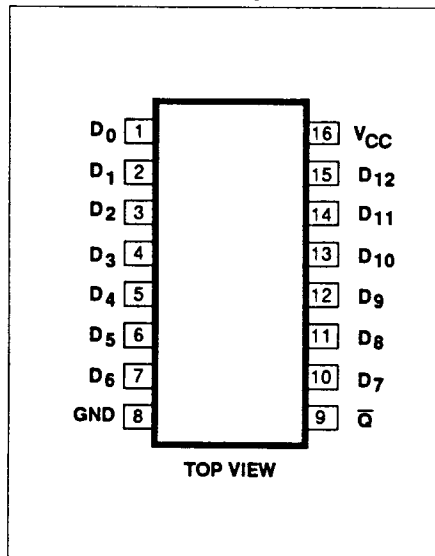
INPUT AND OUTPUT LOADING AND FAN-OUT TABLE

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

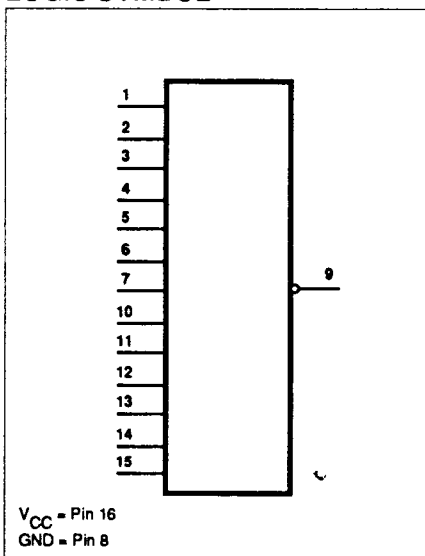
NOTE:

One (1.0) FAST Unit Load is defined as: 20 μ A in the High state and 0.6mA in the Low state.

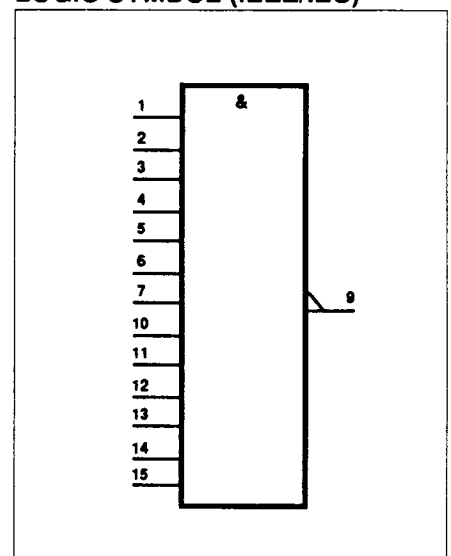
PIN CONFIGURATION



LOGIC SYMBOL



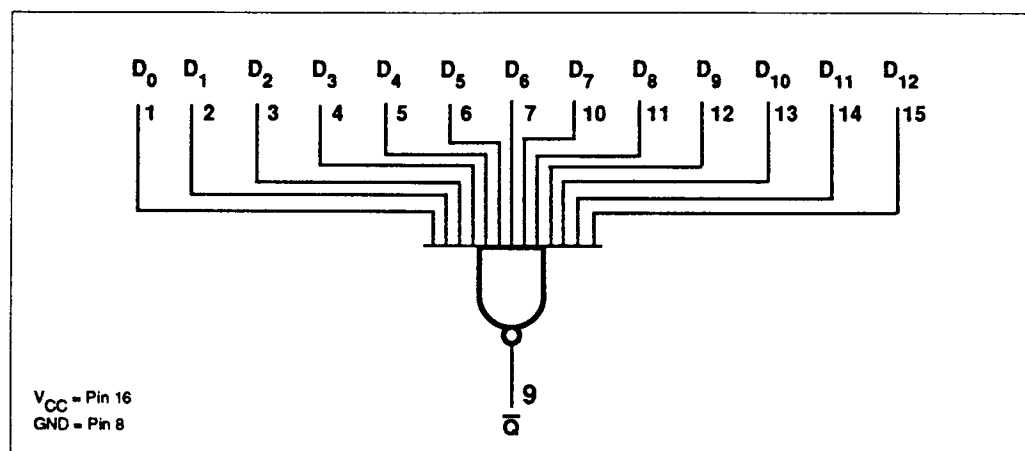
LOGIC SYMBOL (IEEE/IEC)



Gate

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LOGIC DIAGRAM



FUNCTION TABLE

INPUTS													OUTPUT
D_0	D_1	D_2	D_3	D_4	D_5	D_6	D_7	D_8	D_9	D_{10}	D_{11}	D_{12}	$\bar{Q}$
H	H	H	H	H	H	H	H	H	H	H	H	H	L
Any one input = L													H

H = High voltage level

L = Low voltage level

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_{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_A	Operating free-air temperature range	0 to +70	°C
T_{STG}	Storage temperature	-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_H	High-level input voltage	2.0			V
V_L	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_A	Operating free-air temperature range	0		70	°C

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

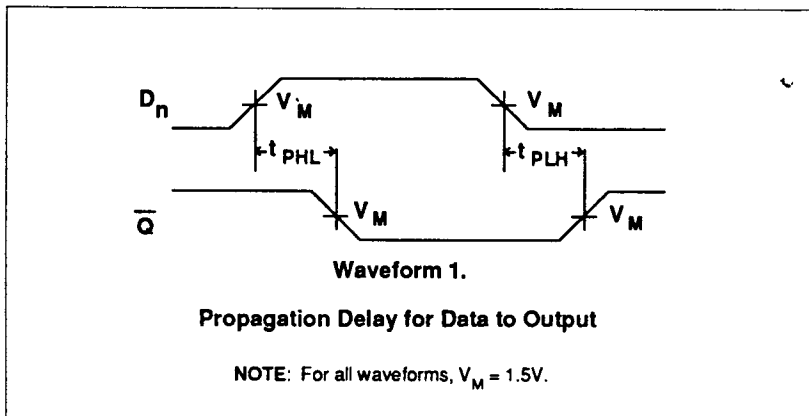
SYMBOL	PARAMETER		TEST CONDITIONS ¹		LIMITS			UNIT
					Min	Typ ²	Max	
V _{OH}	High-level output voltage		V _{CC} = MIN, V _{IL} = MAX	±10%V _{CC}	2.5			V
			V _{IH} = MIN, I _{OH} = MAX	±5%V _{CC}	2.7	3.4		V
V _{OL}	Low-level output voltage		V _{CC} = MIN, V _{IL} = MAX	±10%V _{CC}		0.35	0.50	V
			V _{IH} = MIN, I _{OL} = 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}				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 $V_{CC} = 5\text{V}$, $T_A = 25^\circ\text{C}$.
- 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 test, I_{OS} tests should be performed last.

AC ELECTRICAL CHARACTERISTICS

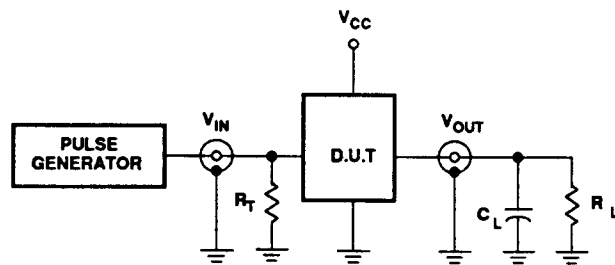
SYMBOL	PARAMETER	TEST CONDITION	LIMITS					UNIT
			$T_A = +25^{\circ}\text{C}$ $V_{CC} = 5\text{V}$ $C_L = 50\text{pF}$ $R_L = 500\Omega$			$T_A = 0^{\circ}\text{C to } +70^{\circ}\text{C}$ $V_{CC} = 5\text{V} \pm 10\%$ $C_L = 50\text{pF}$ $R_L = 500\Omega$		
			Min	Typ	Max	Min	Max	
t_{PLH} t_{PHL}	Propagation delay D_n to Q	Waveform 1	2.0 2.5	4.0 4.5	7.0 7.5	1.5 2.0	7.5 8.0	ns

AC WAVEFORMS

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TEST CIRCUIT AND WAVEFORMS



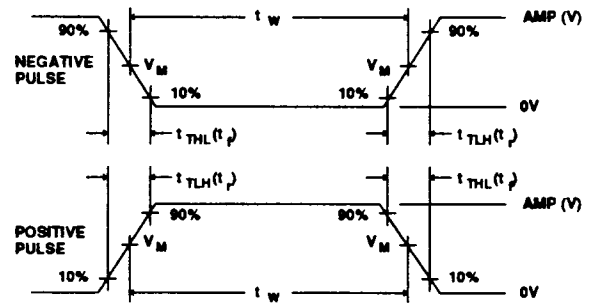
Test Circuit For Totem-Pole Outputs

DEFINITIONS

R_L = Load resistor; see AC CHARACTERISTICS for value.

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

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



$$V_M = 1.5V$$

Input Pulse Definition

FAMILY	INPUT PULSE REQUIREMENTS				
	Amplitude	Rep. Rate	t_W	$t_{TLH}(t_p)$	$t_{THL}(t_p)$
74F	3.0V	1MHz	500ns	2.5ns	2.5ns