

# FAST 74F38 Buffer

Quad Two-Input NAND Buffer (Open Collector)

FAST Products

### Product Specification

TYPE	TYPICAL PROPAGATION DELAY	TYPICAL SUPPLY CURRENT (TOTAL)
74F38	7.0 ns	13 mA

### ORDERING INFORMATION

PACKAGES	COMMERCIAL RANGE $V_{CC} = 5V \pm 10\%$ ; $T_A = 0^\circ C$ to $+70^\circ C$
14-Pin Plastic DIP	N74F38N
14-Pin Plastic SO	N74F38D

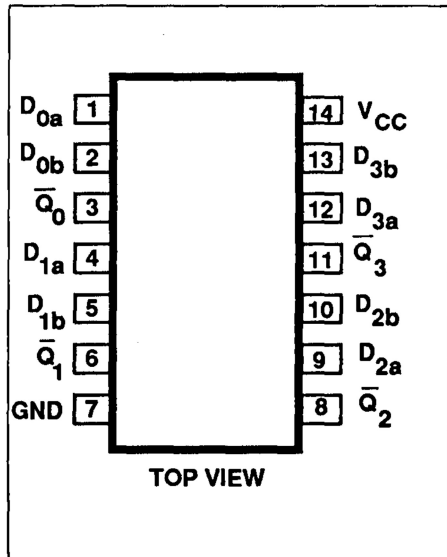
### INPUT AND OUTPUT LOADING AND FAN-OUT TABLE

PINS	DESCRIPTION	74F(U.L.) HIGH/LOW	LOAD VALUE HIGH/LOW
$D_{na}$ , $D_{nb}$	Data inputs	1.0/2.0	20 $\mu$ A/1.2mA
$Q_n$	Data outputs	OC/106.7	OC/64mA

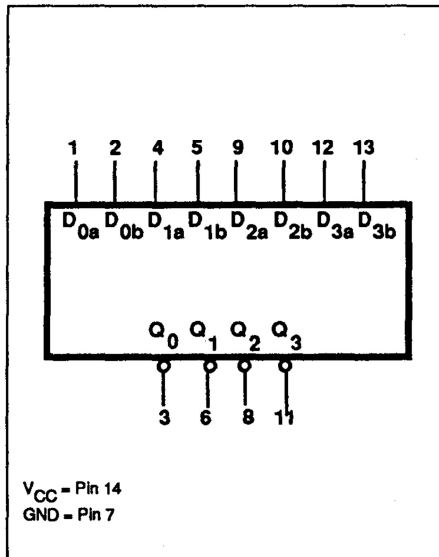
**NOTE:**

One (1.0) FAST Unit Load is defined as: 20 $\mu$ A in the High state and 0.6mA in the Low state.  
OC = Open Collector

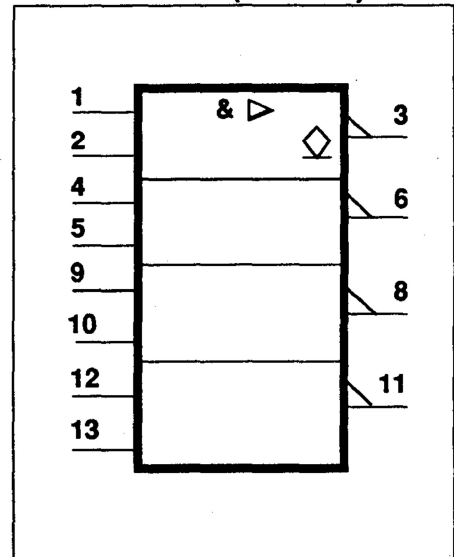
### PIN CONFIGURATION



### LOGIC SYMBOL



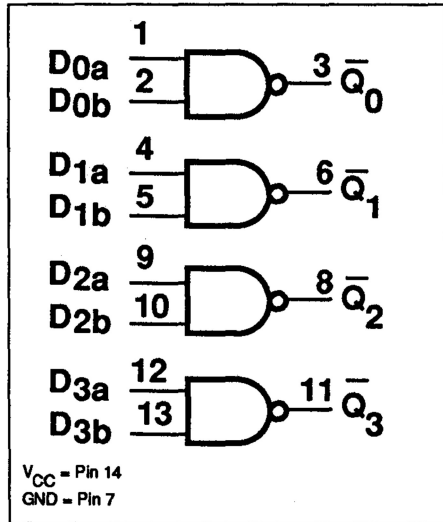
### LOGIC SYMBOL (IEEE/IEC)



Buffer

FAST 74F38

LOGIC DIAGRAM



FUNCTION TABLE

INPUTS		OUTPUT
$D_{na}$	$D_{nb}$	$\bar{Q}_n$
L	L	H
L	H	H
H	L	H
H	H	L

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	128	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
$V_{IH}$	High-level input voltage	2.0			V
$V_{IL}$	Low-level input voltage			0.8	V
$I_{IK}$	Input clamp current			-18	mA
$V_{OH}$	High-level output voltage			4.5	V
$I_{OL}$	Low-level output current			64	mA
$T_A$	Operating free-air temperature range	0		70	°C

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FAST 74F38

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

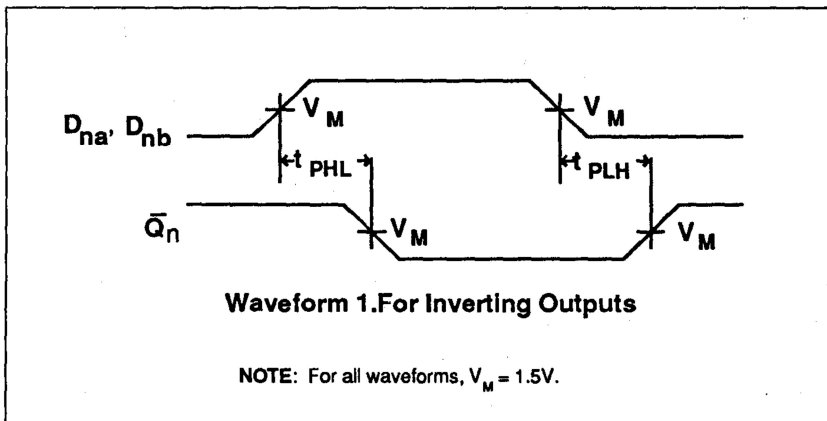
SYMBOL	PARAMETER	TEST CONDITIONS <sup>1</sup>	LIMITS			UNIT	
			Min	Typ <sup>2</sup>	Max		
$I_{OH}$	High-level output current	$V_{CC} = \text{MIN}, V_{IL} = \text{MAX}, V_{IH} = \text{MIN}, V_{OH} = \text{MAX}$			250	$\mu\text{A}$	
$V_{OL}$	Low-level output current	$V_{CC} = \text{MIN}$ $V_{IL} = \text{MAX}$ $V_{IH} = \text{MIN}$	$I_{OL} = 48\text{mA}$	$\pm 10\%V_{CC}$	.38	.55	V
			$I_{OL} = 64\text{mA}$	$\pm 5\%V_{CC}$	.42	.55	V
$V_{IK}$	Input clamp voltage	$V_{CC} = \text{MIN}, I_I = I_{IK}$			-0.73	-1.2	V
$I_I$	Input current at maximum input voltage	$V_{CC} = \text{MAX}, V_I = 7.0\text{V}$				100	$\mu\text{A}$
$I_{IH}$	High-level input current	$V_{CC} = \text{MAX}, V_I = 2.7\text{V}$				20	$\mu\text{A}$
$I_{IL}$	Low-level input current	$V_{CC} = \text{MAX}, V_I = 0.5\text{V}$				-1.2	$\text{mA}$
$I_{CC}$	Supply current [total]	$I_{CCH}$ $I_{CCL}$	$V_{CC} = \text{MAX}$	$V_{IN} = \text{GND}$	4.0	7.0	$\text{mA}$
				$V_{IN} = 4.5\text{V}$	22	30	$\text{mA}$

- 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  $V_{CC} = 5\text{V}, T_A = 25^\circ\text{C}$ .

**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 $D_{na}, D_{nb}$ to $\bar{Q}_n$	Waveform 1	7.5 1.5	10.0 3.0	12.5 5.0	7.5 1.5	13.0 5.5	ns

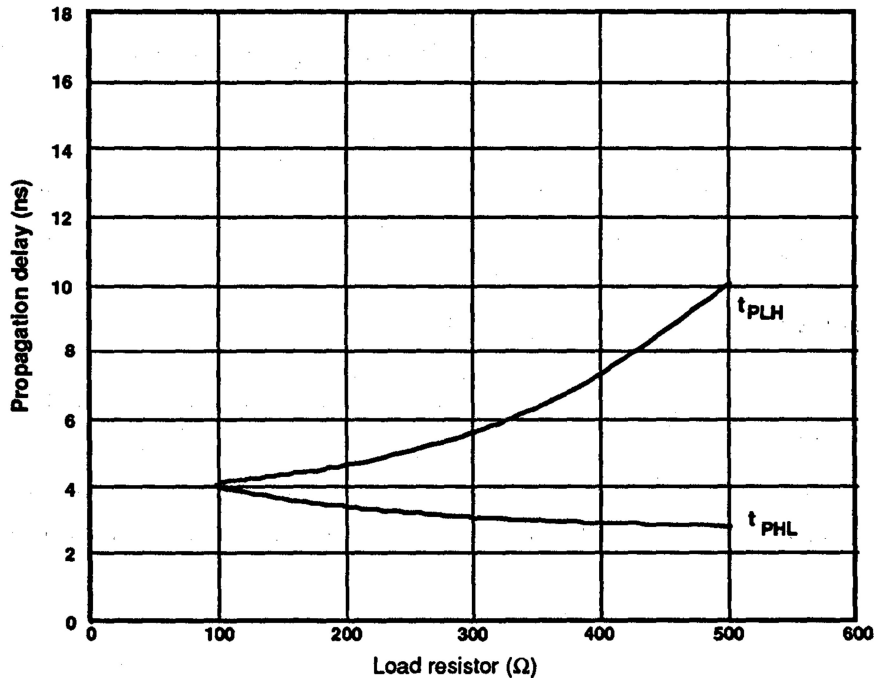
**AC WAVEFORMS**



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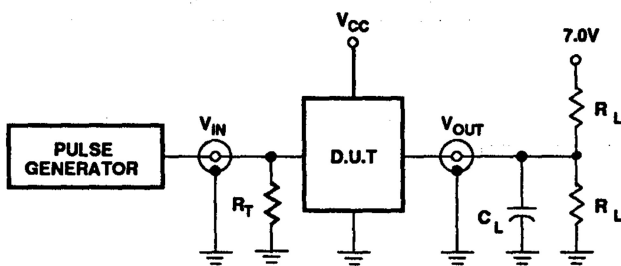
TYPICAL PROPAGATION DELAYS VERSUS LOAD FOR OPEN COLLECTOR OUTPUTS



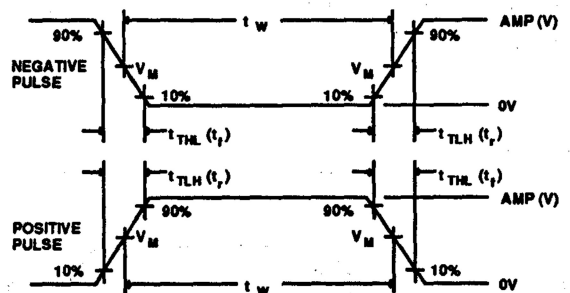
NOTE:

When using Open-Collector parts, the value of the pull-up resistor greatly affects the value of the  $t_{PLH}$ . For example, changing the specified pull-up resistor value from 500Ω to 100Ω will improve the  $t_{PLH}$  up to 50% with only a slight increase in the  $t_{PHL}$ . However, if the value of the pull-up resistor is changed, the user must make certain that the total  $I_{OL}$  current through the resistor and the total  $I_L$ 's of the receivers does not exceed the  $I_{OL}$  maximum specification.

TEST CIRCUIT AND WAVEFORMS



Test Circuit For Open Collector Outputs



$V_M = 1.5V$   
Input Pulse Definition

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.

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