

Octal transceiver with 8-bit parity generator/checker

74F657

Octal transceivers with 8-bit parity generator/checker

FEATURES

- Combines 74F245 and 74F280A functions in one package
- High impedance base input for reduced loading (70µA in high and low states)
- Ideal in applications where high output drive and light bus loading are required (I_{IL} is 70µA vs FAST std of 600µA)
- 3-state buffer outputs sink 64mA and source 15mA
- Input diodes for termination effects
- 24-pin plastic slim DIP (300mil) package
- Industrial temperature range available (-40°C to +85°C)

DESCRIPTION

The 74F657 is an octal transceiver featuring non-inverting buffers with 3-state outputs and an 8-bit parity generator/checker, and is intended for bus-oriented applications. The buffers have a guaranteed current sinking capability of 24mA at the A ports and 64mA at the B ports. The transmit/receive (T/R) input determines the direction of the data flow through the bidirectional transceivers.

Transmit (active high) enables data from A ports to B ports; receive (active low) enables data from B ports to A ports. (continues)

TYPE	TYPICAL PROPAGATION DELAY	TYPICAL SUPPLY CURRENT(TOTAL)
74F657	8.0ns	100mA

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 $+85^\circ C$
24-pin plastic slim DIP (300mil)	N74F657N	I74F657N
24-pin plastic SOL ¹	N74F657D	I74F657D

Note to ordering information

1. Thermal mounting techniques are recommended. See SMD Applications (page 17) for a discussion of thermal consideration for surface mounted devices.

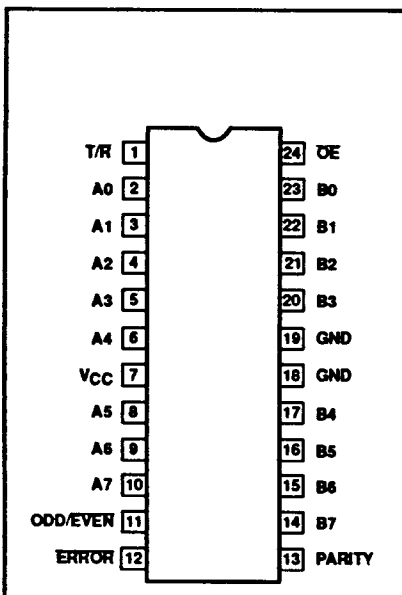
INPUT AND OUTPUT LOADING AND FAN OUT TABLE

PINS	DESCRIPTION	74F (U.L.) HIGH/LOW	LOAD VALUE HIGH/LOW
A0 – A7	A ports 3-state inputs	3.5/0.117	70µA/70µA
B0 – B7	B ports 3-state inputs	3.5/0.117	70µA/70µA
PARITY	Parity input	3.5/0.117	70µA/70µA
T/R	Transmit/receive input	2.0/0.066	40µA/40µA
ODD/EVEN	Parity select input	1.0/0.033	20µA/20µA
OE	Output enable input (active low)	2.0/0.066	40µA/40µA
A0 – A7	A ports 3-state outputs	150/40	3.0mA/24mA
B0 – B7	B ports 3-state outputs	750/106.7	15mA/64mA
PARITY	Parity output	750/106.7	15mA/64mA
ERROR	Error output	750/106.7	15mA/64mA

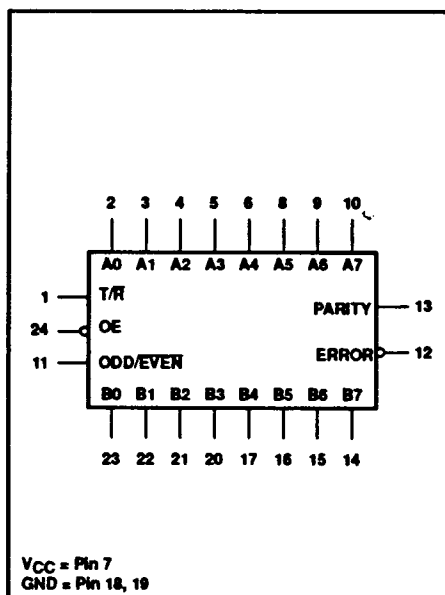
Note to input and output loading and fan out table

1. One (1.0) FAST unit load is defined as: 20µA in the high state and 0.6mA in the low state.

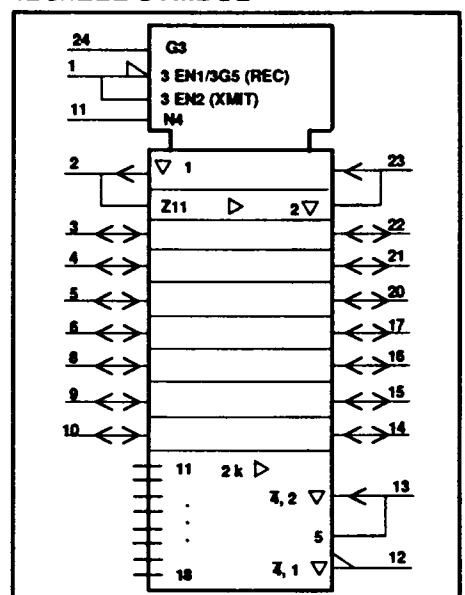
PIN CONFIGURATION



LOGIC SYMBOL



IEC/IEEE SYMBOL



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DESCRIPTION (CONTINUED)

The output enable (OE) input disables both the A and B ports by placing them in a high impedance condition when the OE input is high.

The parity select (ODD/EVEN) input gives the user the option of odd or even parity systems.

The parity (PARITY) pin is an output from the generator/checker when transmitting from the port A to B (T/R = high) and an input when receiving from port B to A port (T/R = low).

When transmitting (T/R = high) the parity select (ODD/EVEN) input is set, then the A port data is polled to determine the number of high bits. The parity (PARITY) output then goes to the logic state determined by the parity select (ODD/EVEN) setting and by the number of high bits on port A.

For example, if the parity select (ODD/EVEN) is set low (even parity), and the number of high bits on port A is odd, then the parity (PARITY) output will be high, transmitting even parity. If the number of high bits on port

A is even, then the parity (PARITY) output will be low, keeping even parity.

When in receive mode (T/R = low) the B port is polled to determine the number of high bits. If parity select (ODD/EVEN) is low (even parity) and the number of highs on port B is:

(1) odd and the parity (PARITY) input is high, then ERROR will be high, significantly no error.

(2) even and the parity (PARITY) input is high, then ERROR will be asserted low, indicating an error.

FUNCTION TABLE

NUMBER OF INPUTS THAT ARE HIGH	INPUTS			INPUT/OUTPUT	OUTPUTS	
	OE	T/R	ODD/EVEN	PARITY	ERROR	OUTPUTS MODE
0, 2, 4, 6, 8	L	H	H	H	Z	Transmit
	L	H	L	L	Z	Transmit
	L	L	H	H	H	Receive
	L	L	H	L	L	Receive
	L	L	L	H	H	Receive
	L	L	L	L	L	Receive
1, 3, 5, 7	L	H	H	L	Z	Transmit
	L	H	L	H	Z	Transmit
	L	L	H	H	L	Receive
	L	L	H	L	H	Receive
	L	L	L	H	H	Receive
	L	L	L	L	L	Receive
Don't care	H	X	X	Z	Z	Z

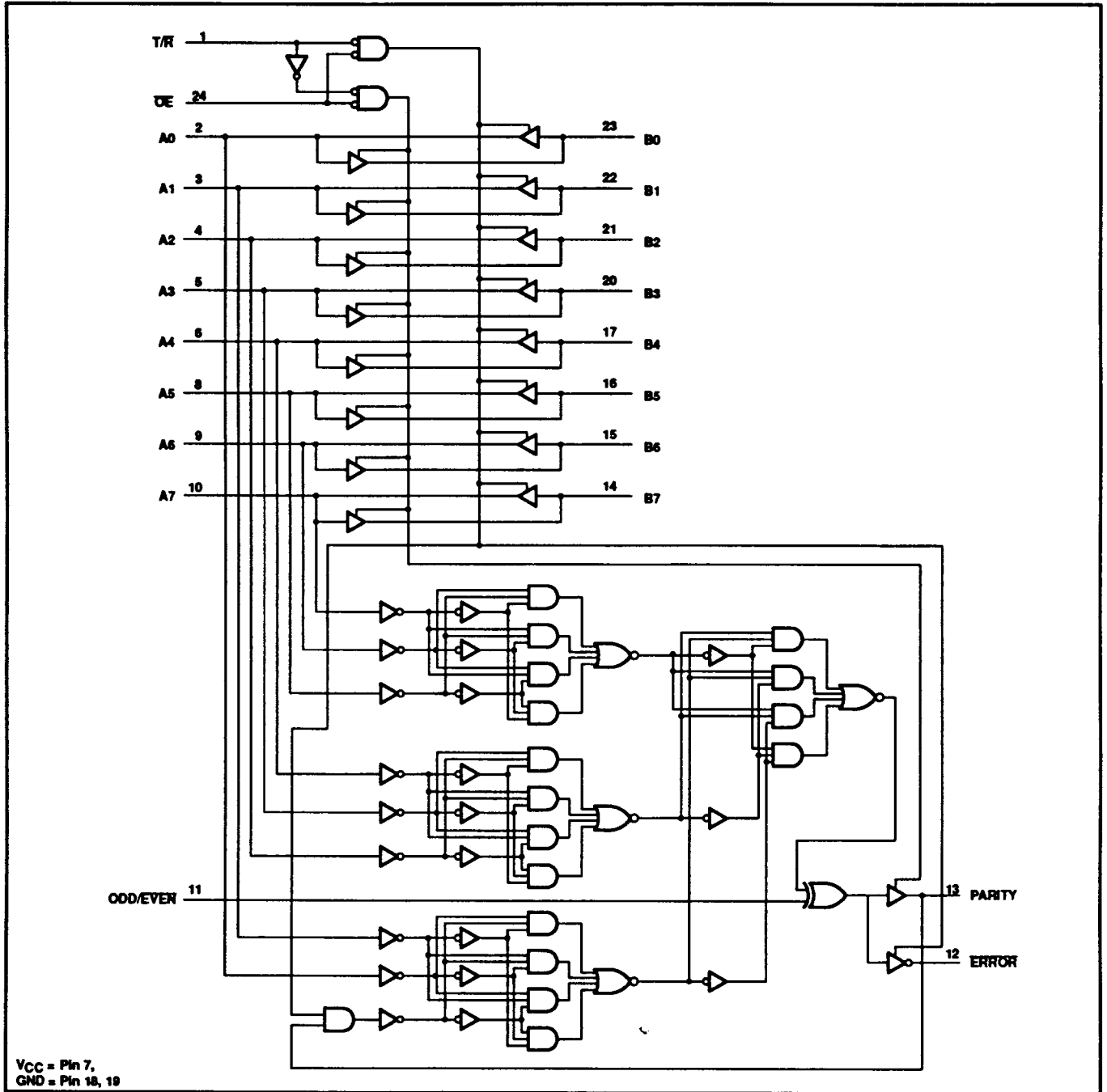
Notes to function table

1. H = High voltage level
2. L = Low voltage level
3. X = Don't care
4. Z = High impedance "off" state

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LOGIC DIAGRAM



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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	A0 – A7	48	mA
		B0 – B7, PARITY, ERROR	128	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	A0 – A7		-3	mA
		B0 – B7, PARITY, ERROR		-15	mA
I _{OL}	Low-level output current	A0 – A7		24	mA
		B0 – B7, PARITY, ERROR		64	mA
T _{amb}	Operating free air temperature range	Commercial range	0	+70	°C
		Industrial range	-40	+85	°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	All outputs	V _{CC} = MIN, V _{IL} = MAX, V _{HI} = MIN	I _{OH} = -3mA ^{4,5}	±10%V _{CC}	2.4			V	
					±5%V _{CC}	2.7			V	
		B0 – B7, PARITY, ERROR		I _{OH} = -12mA ⁵	±10%V _{CC}	2.0			V	
					±5%V _{CC}	2.0			V	
					I _{OH} = -15mA ⁴	±10%V _{CC}	2.0			V
						±5%V _{CC}	2.0			V
V _{OL}	Low-level output voltage	A0 – A7	V _{CC} = MIN, V _{IL} = MAX, V _{HI} = MIN	I _{OL} = 24mA ^{4,5}	±10%V _{CC}		0.35	0.50	V	
					±5%V _{CC}		0.35	0.50	V	
		B0 – B7, PARITY, ERROR		I _{OL} = 48mA ⁴	±10%V _{CC}		0.38	0.55	V	
					±5%V _{CC}		0.42	0.55	V	
					I _{OL} = 48mA ⁵	±10%V _{CC}		0.42	0.55	V
						±5%V _{CC}		0.42	0.55	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	OE, T/R, ODD/EVEN	V _{CC} = 0.0V, V _I = 7.0V				100	μA		
		A0 – A7	V _{CC} = 5.5V, V _I = 5.5V				2	mA		
		B0 – B7					1	mA		
I _{IH}	High-level input current	OOD/EVEN	V _{CC} = MAX, V _I = 2.7V				20 ⁴	μA		
		OE, T/R					40 ⁵	μA		
							40 ⁴	μA		
							80 ⁵	μA		
I _{IL}	Low-level input current	OOD/EVEN	V _{CC} = MAX, V _I = 0.5V				-20	μA		
		OE, T/R					-40	μA		
I _{OZH} + I _{IH}	Off-state output current, high-level voltage applied	A0 – A7, B0 – B7,	V _{CC} = MAX, V _O = 2.7V				70	μA		
I _{OZL} + I _{IL}	Off-state output current, low-level voltage applied	PARITY		V _{CC} = MAX, V _O = 0.5V				-70	μA	
I _{OZH}	Off-state output current, High-level voltage applied	ERROR	V _{CC} = MAX, V _O = 2.7V				50	μA		
I _{OZL}	Off-state output current, low-level voltage applied			V _{CC} = MAX, V _O = 0.5V				-50	μA	
I _{OS}	Short circuit output current ³	A0 – A7	V _{CC} = MAX			-60	-150	mA		
		B0 – B7				-100	-225	mA		
I _{CC}	Supply current (total)	I _{CCH}	V _{CC} = MAX			90	125 ⁴	mA		
		I _{CCL}				90	135 ⁵	mA		
						106	150 ⁴	mA		
						106	160 ⁵	mA		
		I _{CCZ}			98	145	mA			

Notes to DC electrical characteristics

- 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} = 5V, T_{amb} = 25°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.
- For commercial range.
- For industrial range.

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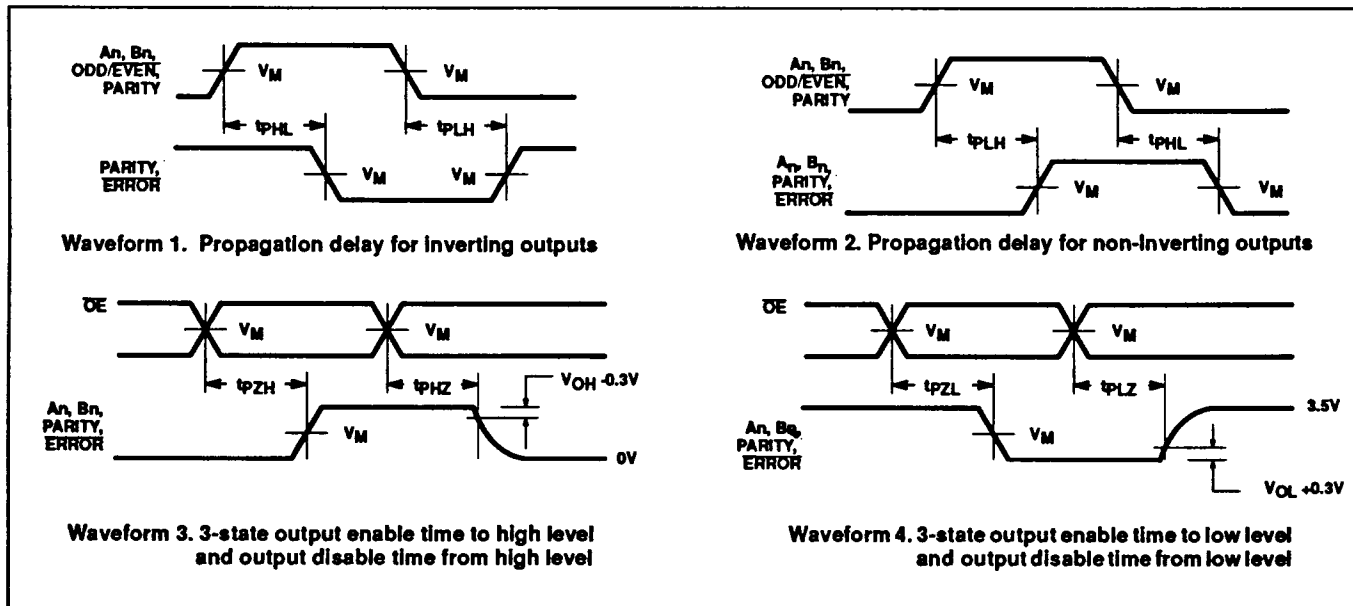
AC ELECTRICAL CHARACTERISTICS

SYMBOL	PARAMETER	TEST CONDITION	LIMITS						UNIT	
			$T_{amb} = +25^{\circ}\text{C}$ $V_{CC} = +5.0\text{V}$ $C_L = 50\text{pF}$ $R_L = 500\Omega$			$T_{amb} = 0^{\circ}\text{C to } +70^{\circ}\text{C}$ $V_{CC} = +5.0\text{V} \pm 10\%$ $C_L = 50\text{pF}$ $R_L = 500\Omega$		$T_{amb} = -40^{\circ}\text{C to } +85^{\circ}\text{C}$ $V_{CC} = +5.0\text{V} \pm 10\%$ $C_L = 50\text{pF}$ $R_L = 500\Omega$		
			MIN	TYP	MAX	MIN	MAX	MIN		MAX
t_{PLH} t_{PHL}	Propagation delay An to Bn or Bn to An	Waveform 2	2.5 3.0	5.5 6.0	7.5 7.5	2.5 3.0	8.0 8.0	2.0 2.5	9.0 9.0	ns
t_{PLH} t_{PHL}	Propagation delay An to PARITY	Waveform 1, 2	7.0 7.0	10.0 10.0	14.0 15.0	7.0 7.0	16.0 16.0	5.5 6.5	16.5 19.0	ns
t_{PLH} t_{PHL}	Propagation delay ODD/EVEN to PARITY, ERROR	Waveform 1, 2	4.5 4.5	7.5 8.0	11.0 11.5	4.5 4.5	12.0 12.5	3.5 4.0	13.0 15.5	ns
t_{PLH} t_{PHL}	Propagation delay Bn to ERROR	Waveform 1, 2	8.0 8.0	14.0 14.0	20.5 20.5	7.5 7.5	22.5 22.5	7.5 7.5	24.5 25.0	ns
t_{PLH} t_{PHL}	Propagation delay PARITY to ERROR	Waveform 1, 2	8.0 8.0	11.5 12.0	15.5 15.5	7.5 8.0	16.5 17.0	6.5 6.5	18.5 20.0	ns
t_{PZH} t_{PZL}	Output enable time ¹ to high or low level	Waveform 3, 4	3.0 4.0	5.5 7.0	8.0 9.5	3.0 4.0	9.0 11.0	2.0 4.0	9.0 13.0	ns
t_{PHZ} t_{PLZ}	Output disable time from high or low level	Waveform 3, 4	2.0 2.0	4.5 4.0	7.5 6.0	2.0 2.0	8.0 6.5	1.0 1.0	8.0 7.5	ns

Note to AC electrical characteristics

1. These delay times reflect the 3-state recovery time only and not the signal through the buffers or the parity check circuitry. To assure **VALID** information at the **ERROR** pin, time must be allowed for the signal to propagate through the drivers (B to A), through the parity check circuitry (same as A to PARITY), and to the **ERROR** output. **VALID** data at the **ERROR** pin \geq (B to A) + (A to PARITY).

AC WAVEFORMS



Note to AC waveforms

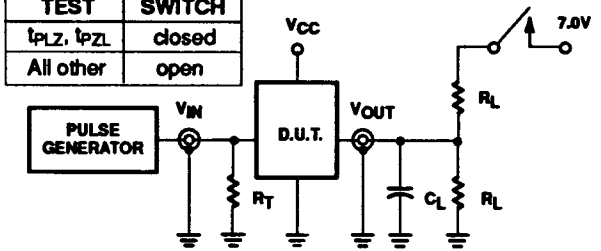
1. For all waveforms, $V_M = 1.5\text{V}$.

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TEST CIRCUIT AND WAVEFORMS

TEST	SWITCH
t_{PLZ} , t_{PZL}	closed
All other	open



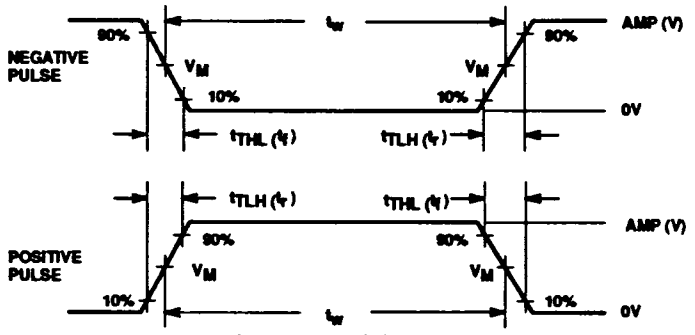
Test circuit for 3-state outputs

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.



Input pulse definition

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