

# 54ABT244

## Octal Buffer/Line Driver with TRI-STATE® Outputs

### General Description

The 'ABT244 is an octal buffer and line driver with TRI-STATE outputs designed to be employed as a memory and address driver, clock driver, or bus-oriented transmitter/receiver.

### Features

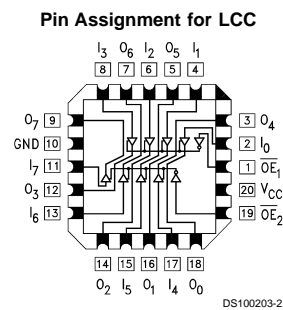
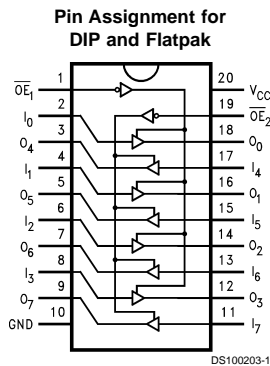
- Non-inverting buffers
- Output sink capability of 48 mA, source capability of 24 mA
- Output switching specified for both 50 pF and 250 pF loads

- Guaranteed simultaneous switching, noise level and dynamic threshold performance
- Guaranteed latchup protection
- High impedance glitch free bus loading during entire power up and power down cycle
- Nondestructive hot insertion capability
- Disable time less than enable time to avoid bus contention
- Standard Microcircuit Drawing (SMD) 5962-9214701

### Ordering Code

Military	Package Number	Package Description
54ABT244J-QML	J20A	20-Lead Ceramic Dual-In-Line
54ABT244W-QML	W20A	20-Lead Cerpack
54ABT244E-QML	E20A	20-Lead Ceramic Leadless Chip Carrier, Type C

### Connection Diagrams



Pin Names	Description
$\overline{OE}_1, \overline{OE}_2$	Output Enable Input (Active Low)
$I_0-I_7$	Inputs
$O_0-O_7$	Outputs

### Truth Table

$\overline{OE}_1$	$I_{0-3}$	$O_{0-3}$	$\overline{OE}_2$	$I_{4-7}$	$O_{4-7}$
H	X	Z	H	X	Z
L	H	H	L	H	H
L	L	L	L	L	L

H = HIGH Voltage Level  
 L = LOW Voltage Level  
 X = Immaterial  
 Z = High Impedance

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## Absolute Maximum Ratings (Note 1)

If Military/Aerospace specified devices are required, please contact the National Semiconductor Sales Office/Distributors for availability and specifications.

Storage Temperature	-65°C to +150°C
Ambient Temperature under Bias	-55°C to +125°C
Junction Temperature under Bias	
Ceramic	-55°C to +175°C
V <sub>CC</sub> Pin Potential to Ground Pin	-0.5V to +7.0V
Input Voltage (Note 2)	-0.5V to +7.0V
Input Current (Note 2)	-30 mA to +5.0 mA
Voltage Applied to Any Output in the Disabled or Power-Off State	-0.5V to 5.5V
in the HIGH State	-0.5V to V <sub>CC</sub>

Current Applied to Output in LOW State (Max)	twice the rated I <sub>OL</sub> (mA)
DC Latchup Source Current	-500 mA
Over Voltage Latchup (I/O)	10V

## Recommended Operating Conditions

Free Air Ambient Temperature	
Military	-55°C to +125°C
Supply Voltage	
Military	+4.5V to +5.5V
Minimum Input Edge Rate	(ΔV/Δt)
Data Input	50 mV/ns
Enable Input	20 mV/ns

## DC Electrical Characteristics

Symbol	Parameter	ABT244			Units	V <sub>CC</sub>	Conditions
		Min	Typ	Max			
V <sub>IH</sub>	Input HIGH Voltage	2.0			V		Recognized HIGH Signal
V <sub>IL</sub>	Input LOW Voltage						Recognized LOW Signal
V <sub>CD</sub>	Input Clamp Diode Voltage					Min	I <sub>IN</sub> = -18 mA
V <sub>OH</sub>	Output HIGH Voltage	54ABT	2.5		V	Min	I <sub>OH</sub> = -3 mA
		54ABT	2.0		V	Min	I <sub>OH</sub> = -24 mA
V <sub>OL</sub>	Output LOW Voltage	54ABT	0.55		V	Min	I <sub>OL</sub> = 48 mA
I <sub>IH</sub>	Input HIGH Current			5	μA	Max	V <sub>IN</sub> = 2.7V (Note 4)
				5	μA	Max	V <sub>IN</sub> = V <sub>CC</sub>
I <sub>BVI</sub>	Input HIGH Current Breakdown Test			7	μA	Max	V <sub>IN</sub> = 7.0V
I <sub>IL</sub>	Input LOW Current			-5	μA	Max	V <sub>IN</sub> = 0.5V (Note 4)
				-5	μA	Max	V <sub>IN</sub> = 0.0V
V <sub>ID</sub>	Input Leakage Test	4.75			V	0.0	I <sub>ID</sub> = 1.9 μA All Other Pins Grounded
I <sub>OZH</sub>	Output Leakage Current	50			μA	0 - 5.5V	V <sub>OUT</sub> = 2.7V; $\overline{OE}_n = 2.0V$
I <sub>OZL</sub>	Output Leakage Current	-50			μA	0 - 5.5V	V <sub>OUT</sub> = 0.5V; $\overline{OE}_n = 2.0V$
I <sub>OS</sub>	Output Short-Circuit Current	-100	-275		mA	Max	V <sub>OUT</sub> = 0.0V
I <sub>CEX</sub>	Output High Leakage Current	50			μA	Max	V <sub>OUT</sub> = V <sub>CC</sub>
I <sub>ZZ</sub>	Bus Drainage Test	100			μA	0.0	V <sub>OUT</sub> = 5.5V; All Others GND
I <sub>CCH</sub>	Power Supply Current	50			μA	Max	All Outputs HIGH
I <sub>CCL</sub>	Power Supply Current	30			mA	Max	All Outputs LOW
I <sub>CCZ</sub>	Power Supply Current	50			μA	Max	$\overline{OE}_n = V_{CC}$ ; All Others at V <sub>CC</sub> or Ground
I <sub>CCT</sub>	Additional I <sub>CC</sub> /Input	Outputs Enabled	2.5		mA	Max	V <sub>I</sub> = V <sub>CC</sub> - 2.1V
		Outputs TRI-STATE	2.5		mA	Max	Enable Input V <sub>I</sub> = V <sub>CC</sub> - 2.1V
		Outputs TRI-STATE	50		μA	Max	Data Input V <sub>I</sub> = V <sub>CC</sub> - 2.1V All Others at V <sub>CC</sub> or Ground
I <sub>CCD</sub>	Dynamic I <sub>CC</sub>	No Load	0.1		mA/ MHz	Max	Outputs Open $\overline{OE}_n = GND$ , (Note 3) One Bit Toggling, 50% Duty Cycle

**Note 1:** Absolute maximum ratings are values beyond which the device may be damaged or have its useful life impaired. Functional operation under these conditions is not implied.

**Note 2:** Either voltage limit or current limit is sufficient to protect inputs.

**Note 3:** For 8 bits toggling, I<sub>CCD</sub> < 0.8 mA/MHz.

**Note 4:** Guaranteed, but not tested.

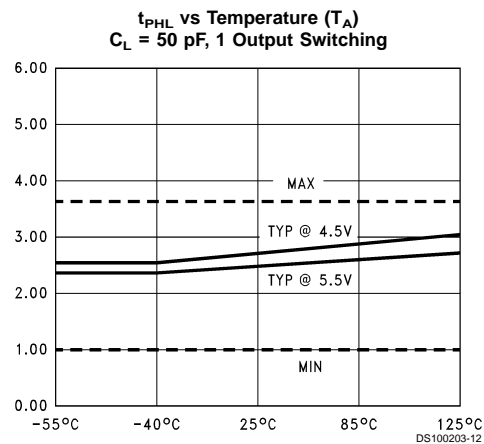
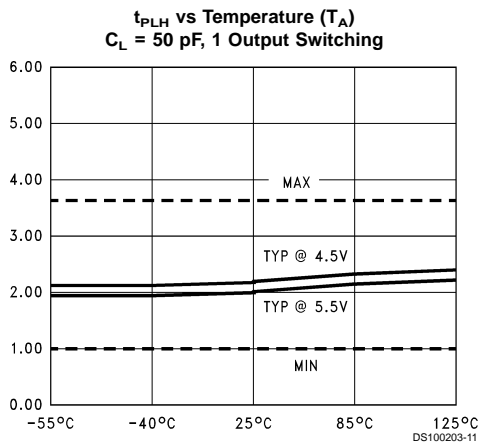
## AC Electrical Characteristics

Symbol	Parameter	54ABT		Units	Fig. No.
		$T_A = -55^\circ\text{C to } +125^\circ\text{C}$			
		$V_{CC} = 4.5\text{V} - 5.5\text{V}$			
		Min	Max		
$t_{PLH}$	Propagation Delay	1.0	5.3	ns	Figure 5
$t_{PHL}$	Data to Outputs	1.0	5.0		
$t_{PZH}$	Output Enable	0.8	6.5	ns	Figure 4
$t_{PZL}$	Time	1.2	7.9		
$t_{PHZ}$	Output Disable	1.2	7.6	ns	Figure 4
$t_{PLZ}$	Time	1.0	7.9		

## Capacitance

Symbol	Parameter	Typ	Units	Conditions $T_A = 25^\circ\text{C}$
$C_{IN}$	Input Capacitance	5.0	pF	$V_{CC} = 0\text{V}$
$C_{OUT}$ (Note 5)	Output Capacitance	9.0	pF	$V_{CC} = 5.0\text{V}$

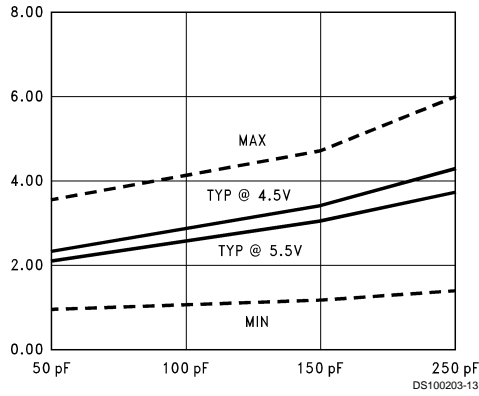
**Note 5:**  $C_{OUT}$  is measured at frequency  $f = 1\text{ MHz}$ , per MIL-STD-883B, Method 3012.



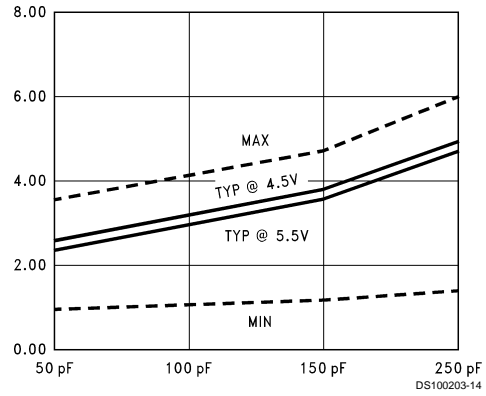
Dashed lines represent design characteristics; for specified guarantees refer to AC Characteristics Table.

## Capacitance (Continued)

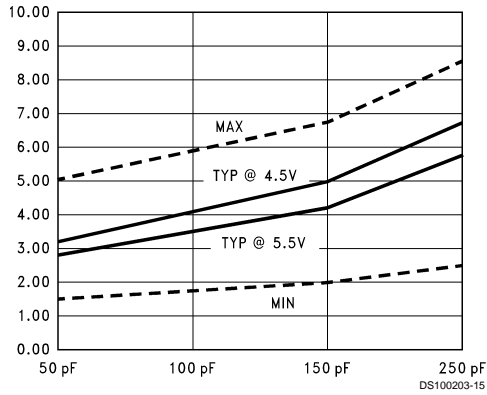
**$t_{PLH}$  vs Load Capacitance**  
1 Output Switching,  $T_A = 25^\circ\text{C}$



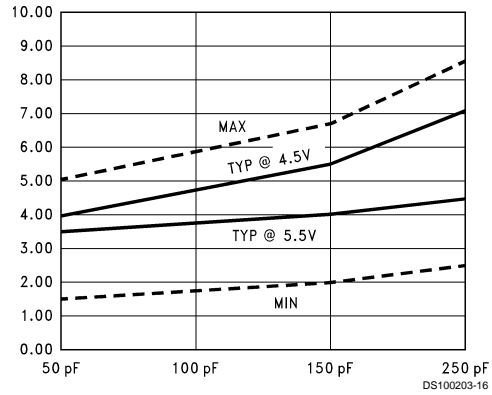
**$t_{PHL}$  vs Load Capacitance**  
1 Output Switching,  $T_A = 25^\circ\text{C}$



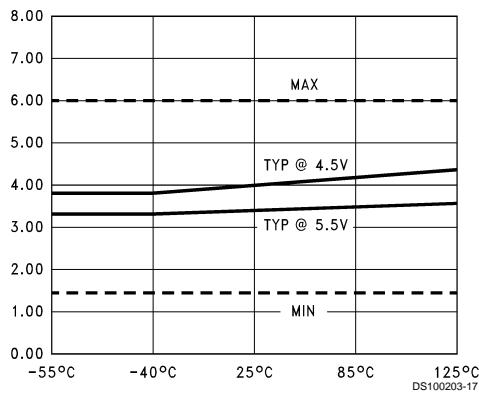
**$t_{PLH}$  vs Load Capacitance**  
8 Outputs Switching,  $T_A = 25^\circ\text{C}$



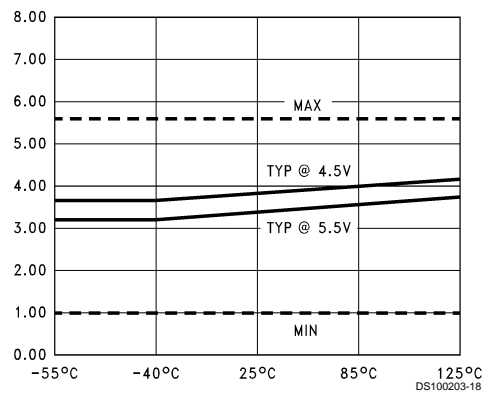
**$t_{PHL}$  vs Load Capacitance**  
8 Outputs Switching,  $T_A = 25^\circ\text{C}$



**$t_{PZL}$  vs Temperature ( $T_A$ )**  
 $C_L = 50\text{ pF}$ , 1 Output Switching

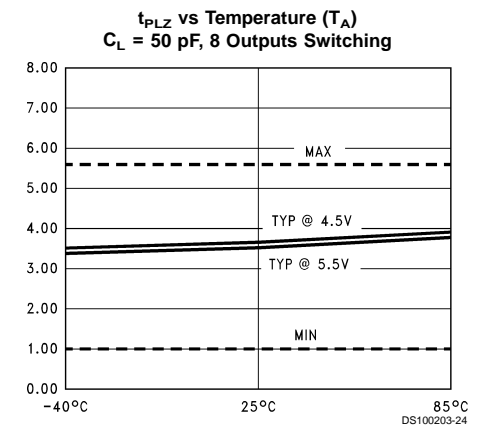
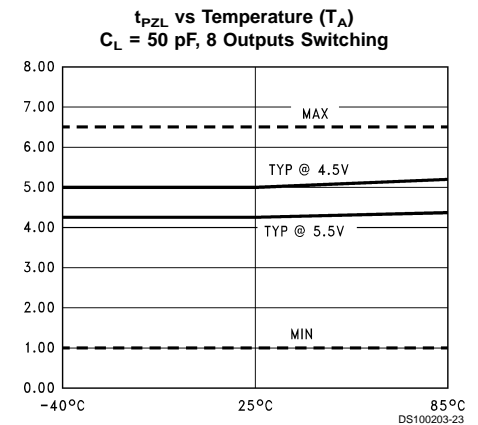
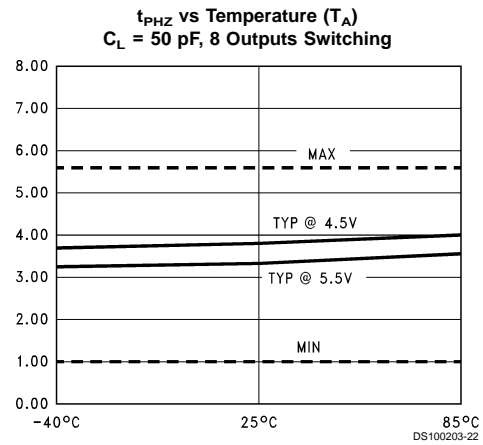
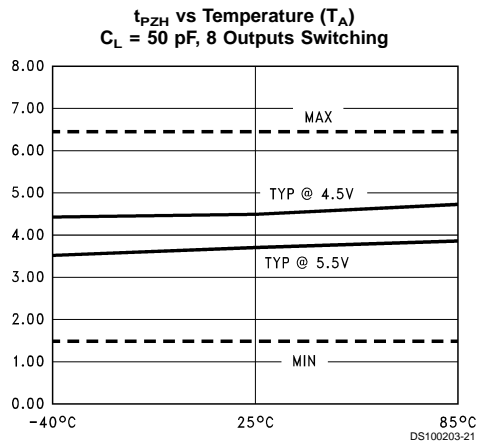
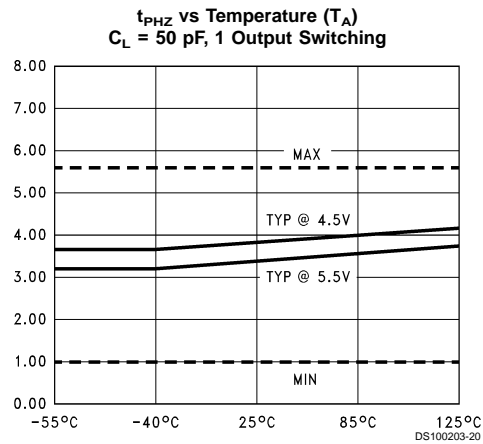
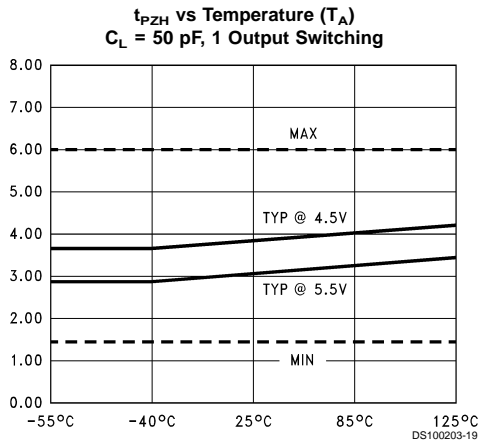


**$t_{PLZ}$  vs Temperature ( $T_A$ )**  
 $C_L = 50\text{ pF}$ , 1 Output Switching



Dashed lines represent design characteristics; for specified guarantees refer to AC Characteristics Table.

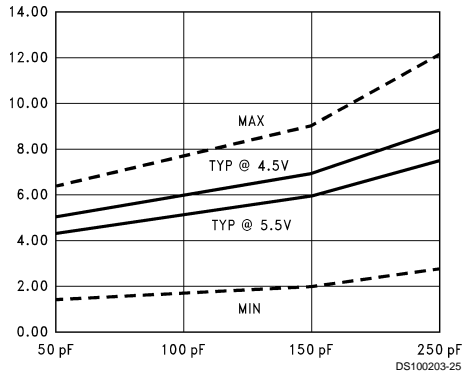
## Capacitance (Continued)



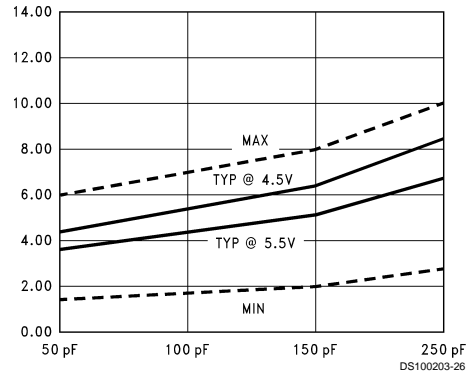
Dashed lines represent design characteristics; for specified guarantees refer to AC Characteristics Table.

## Capacitance (Continued)

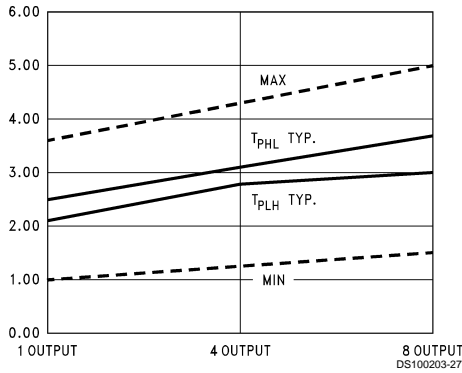
**$t_{PZL}$  vs Load Capacitance**  
**8 Outputs Switching**  
 $T_A = 25^\circ\text{C}$



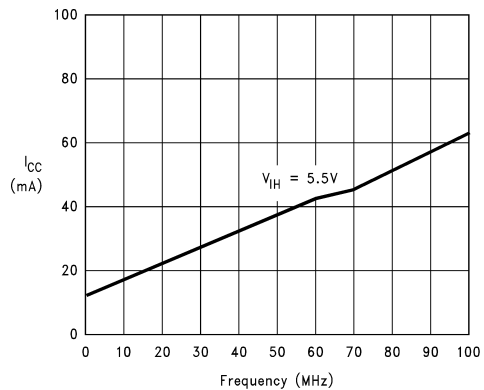
**$t_{PZH}$  vs Load Capacitance**  
**8 Outputs Switching**  
 $T_A = 25^\circ\text{C}$



**$t_{PLH}$  and  $t_{PHL}$  vs Number**  
**Outputs Switching  $V_{CC} = 5.0\text{V}$ ,**  
 $T_A = 25^\circ\text{C}$ ,  $C_L = 50\text{ pF}$

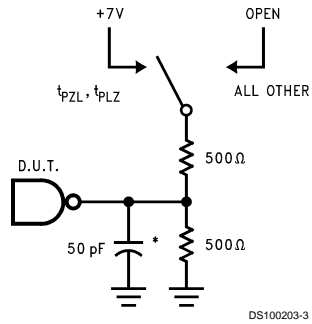


**$I_{CC}$  vs Frequency,**  
**Average,  $T_A = 25^\circ\text{C}$ ,**  
**All Outputs Unloaded/Unterminated**



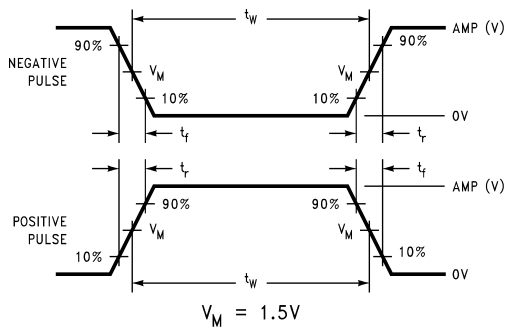
Dashed lines represent design characteristics; for specified guarantees refer to AC Characteristics Table.

## AC Loading



\*Includes jig and probe capacitance

**FIGURE 1. Standard AC Test Load**

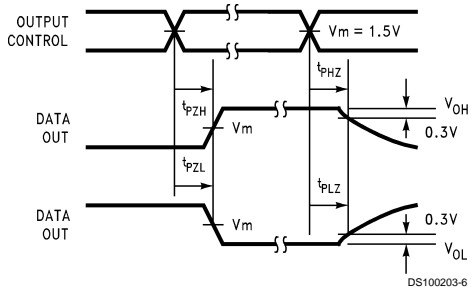


**FIGURE 2. Test Input Signal Levels**

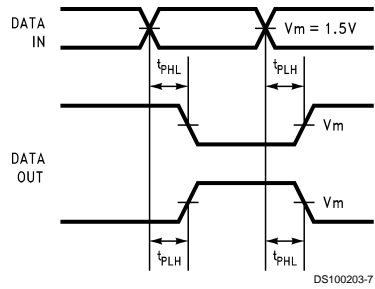
Amplitude	Rep. Rate	$t_w$	$t_r$	$t_f$
3.0V	1 MHz	500 ns	2.5 ns	2.5 ns

**FIGURE 3. Test Input Signal Requirements**

## AC Waveforms



**FIGURE 4. TRI-STATE Output HIGH and LOW Enable and Disable Times**

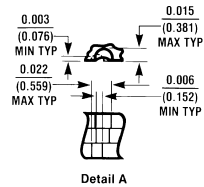
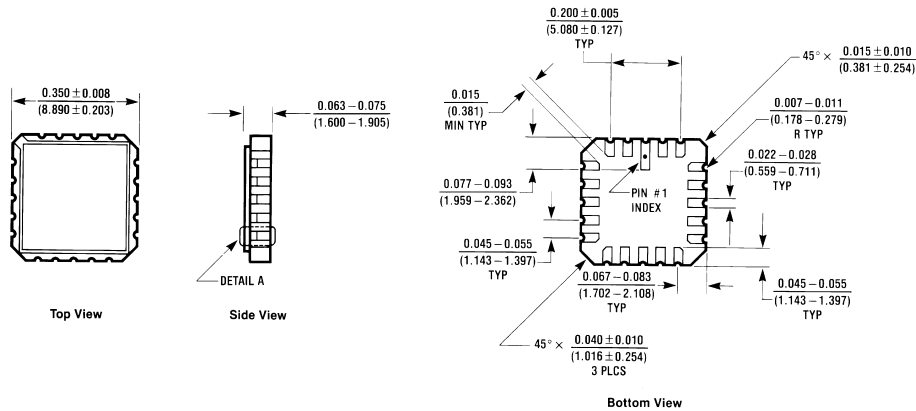


**FIGURE 5. Propagation Delay Waveforms for Inverting and Non-Inverting Functions**



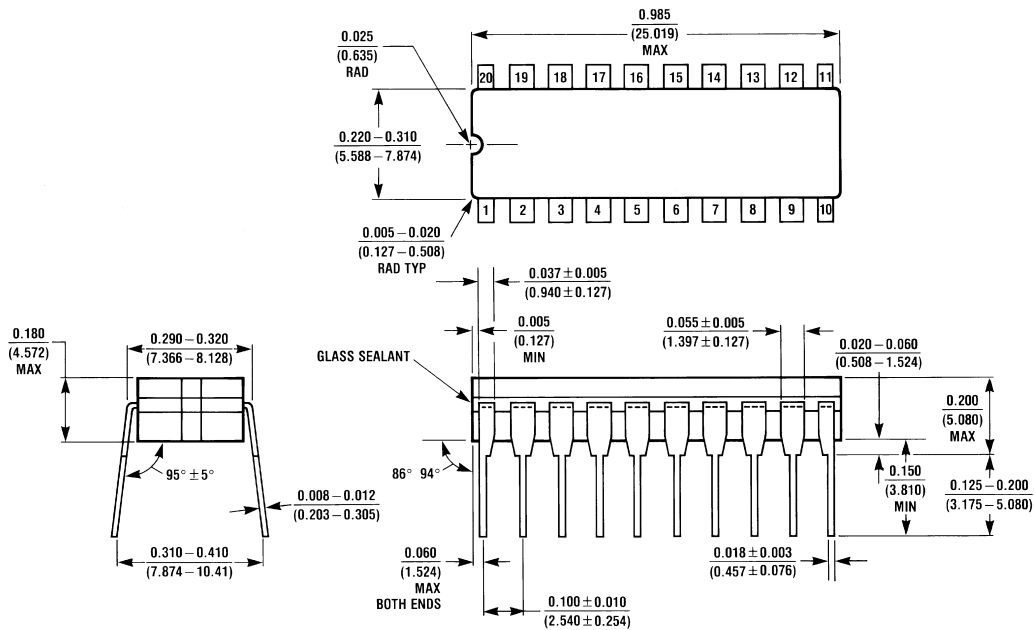


**Physical Dimensions** inches (millimeters) unless otherwise noted



E20A (REV D)

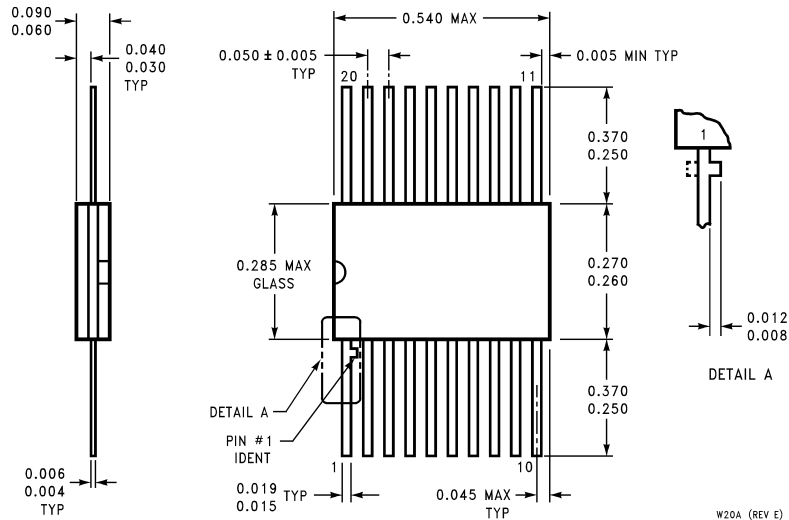
**20-Terminal Ceramic Chip Carrier (L)**  
 NS Package Number E20A



J20A (REV M)

**20-Lead Ceramic Dual-In-Line (D)**  
 NS Package Number J20A

**Physical Dimensions** inches (millimeters) unless otherwise noted (Continued)



**20-Lead Ceramic Flatpak (F)  
NS Package Number W20A**

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