National Semiconductor

August 1998

54ABT541
Octal Buffer/Line Driver with TRI-STATE® Outputs

General Description

The 'ABT541 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. The 'ABT541 is similar to the 'ABT244 with broadside pinout.

Features

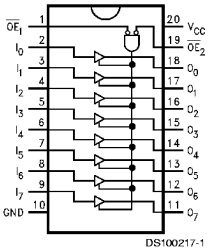
- Non-inverting buffers
- Output sink capability of 48 mA, source capability of 24 mA
- Guaranteed latchup protection
- High impedance glitch free bus loading during entire power up and power down cycle
- Nondestructive hot insertion capability
- Flow-through pinout for ease of PC board layout
- Disable time less than enable time to avoid bus contention
- Standard Microcircuit Drawing (SMD) 5962-9471801

Ordering Code

Military	Package Number	Package Description
54ABT541J-QML	J20A	20-Lead Ceramic Dual-In-Line
54ABT541W-QML	W20A	20-Lead Cerpack
54ABT541E-QML	E20A	20-Lead Ceramic Leadless Chip Carrier, Type C

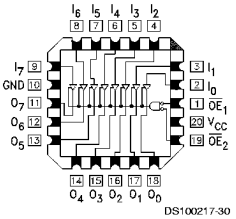
Connection Diagram

Pin Assignment
DIP and Cerpack



DS100217-1

Pin Assignment
LCC



DS100217-30

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

Inputs			Outputs
$\overline{OE}_1$	$\overline{OE}_2$	I	ABT541
L	L	H	H
H	X	X	Z
X	H	X	Z
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)

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_{CC} 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_{CC}
Current Applied to Output	
in LOW State (Max)	twice the rated I_{OL} (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		ABT541 Min	ABT541 Typ	ABT541 Max	Units	V_{CC}	Conditions
V_{IH}	Input HIGH Voltage		2.0			V		Recognized HIGH Signal
V_{IL}	Input LOW Voltage				0.8	V		Recognized LOW Signal
V_{CD}	Input Clamp Diode Voltage				−1.2	V	Min	I_{IN} = −18 mA
V_{OH}	Output HIGH Voltage	54ABT	2.5			V	Min	I_{OH} = −3 mA
		54ABT	2.0			V	Min	I_{OH} = −24 mA
V_{OL}	Output LOW Voltage	54ABT			0.55	V	Min	I_{OL} = 48 mA
I_{IH}	Input HIGH Current				5	μA	Max	V_{IN} = 2.7V (Note 4)
					5			V_{IN} = V_{CC}
I_{BVI}	Input HIGH Current Breakdown Test				7	μA	Max	V_{IN} = 7.0V
I_{IL}	Input LOW Current				−5	μA	Max	V_{IN} = 0.5V (Note 4)
					−5			V_{IN} = 0.0V
V_{ID}	Input Leakage Test		4.75			V	0.0	I_{ID} = 1.9 μA All Other Pins Grounded
I_{OZH}	Output Leakage Current				50	μA	0 – 5.5V	V_{OUT} = 2.7V; $\overline{OE}_n$ = 2.0V
I_{OZL}	Output Leakage Current				−50	μA	0 – 5.5V	V_{OUT} = 0.5V; $\overline{OE}_n$ = 2.0V
I_{OS}	Output Short-Circuit Current		−100		−275	mA	Max	V_{OUT} = 0.0V
I_{CEX}	Output High Leakage Current				50	μA	Max	V_{OUT} = V_{CC}
I_{ZZ}	Bus Drainage Test				100	μA	0.0	V_{OUT} = 5.5V; All Others GND
I_{CCH}	Power Supply Current				50	μA	Max	All Outputs HIGH
I_{CCL}	Power Supply Current				30	mA	Max	All Outputs LOW
I_{CCZ}	Power Supply Current				50	μA	Max	$\overline{OE}_n$ = V_{CC}; All Others at V_{CC} or Ground
I_{CCT}	Additional I_{CC}/Input	Outputs Enabled			2.5	mA		V_I = V_{CC} − 2.1V
		Outputs TRI-STATE			2.5	mA	Max	Enable Input V_I = V_{CC} − 2.1V
		Outputs TRI-STATE			50	μA		Data Input V_I = V_{CC} − 2.1V; All Others at V_{CC} or Ground
I_{CCD}	Dynamic I_{CC} (Note 4)	No Load			0.1	mA/MHz	Max	Outputs Open, $\overline{OE}_n$ = GND, One Bit Toggling (Note 3), 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_{CCD} < 0.8 mA/MHz.

Note 4: Guaranteed, but not tested.

DC Electrical Characteristics

Symbol	Parameter	Min	Max	Units	V_{CC}	Conditions C_L = 50 pF, R_L = 500Ω
V_{OLP}	Quiet Output Maximum Dynamic V_{OL}		1.0	V	5.0	T_A = 25°C (Note 5)
V_{OLV}	Quiet Output Minimum Dynamic V_{OL}		-1.45	V	5.0	T_A = 25°C (Note 5)

Note 5: Max number of outputs defined as (n). n – 1 data inputs are driven 0V to 3V. One output at LOW. Guaranteed, but not tested.

AC Electrical Characteristics

Symbol	Parameter	54ABT T_A = –55°C to +125°C V_{CC} = 4.5V–5.5V C_L = 50 pF		Units
		Min	Max	
t_{PLH}	Propagation Delay	1.0	5.0	ns
t_{PHL}	Data to Outputs	1.0	5.3	
t_{PZH}	Output Enable Time	1.1	7.2	ns
t_{PZL}		1.5	7.9	
t_{PHZ}	Output Disable Time	1.5	7.5	ns
t_{PLZ}		1.5	7.9	

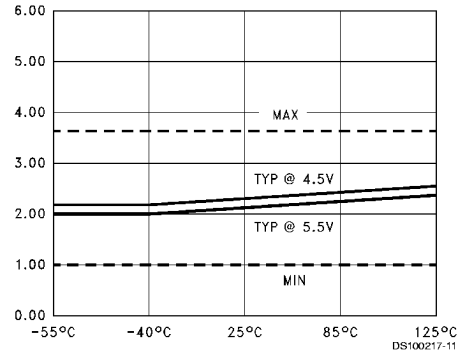
Capacitance

Symbol	Parameter	Typ	Units	Conditions T_A = 25°C
C_{IN}	Input Capacitance	5.0	pF	V_{CC} = 0.0V
C_{OUT} (Note 6)	Output Capacitance	9.0	pF	V_{CC} = 5.0V

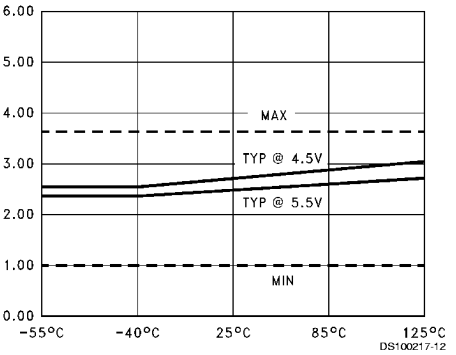
Note 6: C_{OUT} is measured at frequency of f = 1 MHz, per MIL-STD-883B, Method 3012.

Capacitance (Continued)

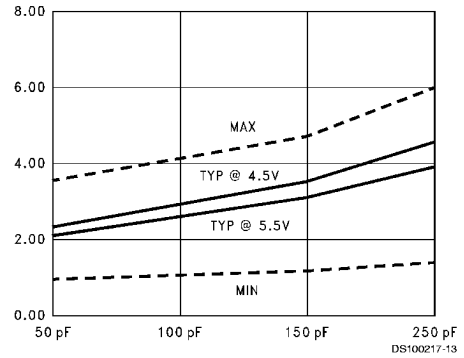
t_{PLH} vs Temperature (T_A)
C_L = 50 pF, 1 Output Switching



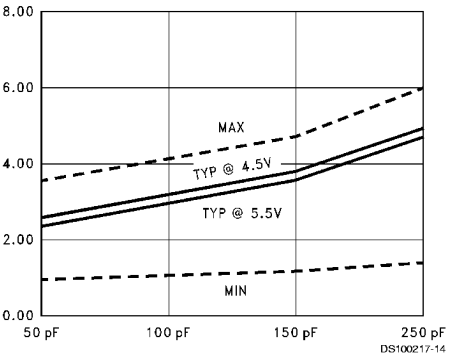
t_{PHL} vs Temperature (T_A)
C_L = 50 pF, 1 Output Switching



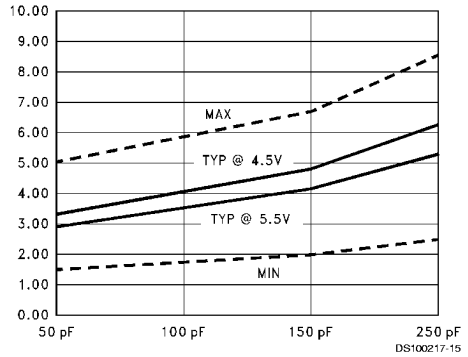
t_{PLH} vs Load Capacitance
1 Output Switching, T_A = 25°C



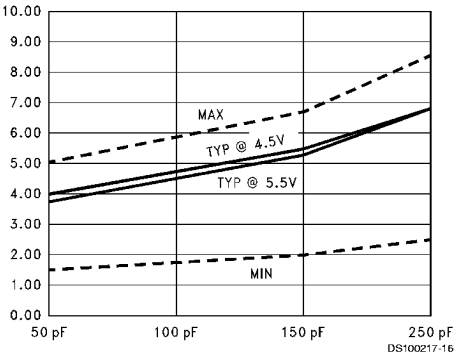
t_{PHL} vs Load Capacitance
1 Output Switching, T_A = 25°C



t_{PLH} vs Load Capacitance
8 Outputs Switching, T_A = 25°C



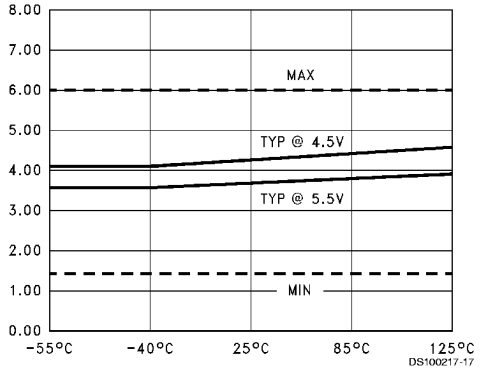
t_{PHL} vs Load Capacitance
8 Outputs Switching, T_A = 25°C



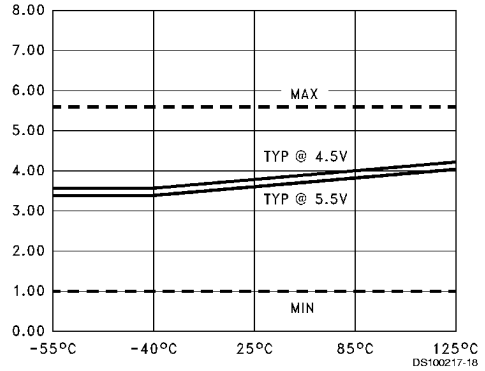
Dashed lines represent design characteristics; for specified guarantees refer to AC Characteristics Table.

Capacitance (Continued)

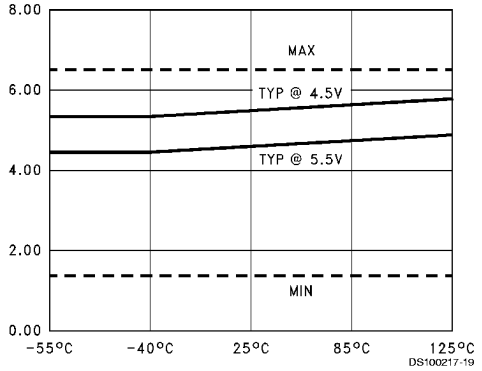
t_{PZL} vs Temperature (T_A)
C_L = 50 pF, 1 Output Switching



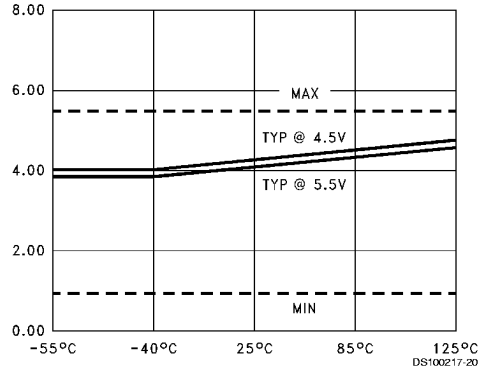
t_{PLZ} vs Temperature (T_A)
C_L = 50 pF, 1 Output Switching



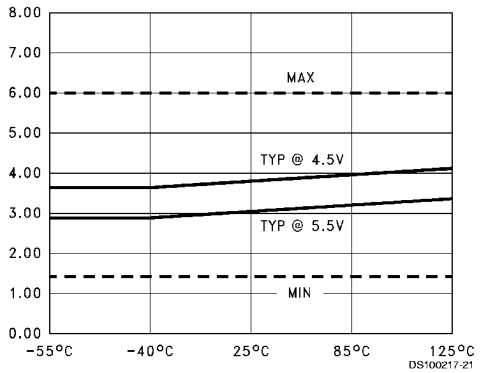
t_{PZL} vs Temperature (T_A)
C_L = 50 pF, 8 Outputs Switching



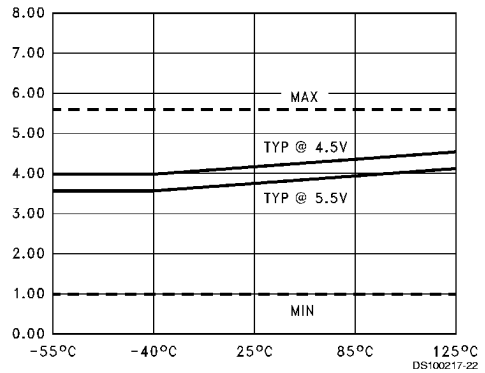
t_{PLZ} vs Temperature (T_A)
C_L = 50 pF, 8 Outputs Switching



t_{PZH} vs Temperature (T_A)
C_L = 50 pF, 1 Output Switching



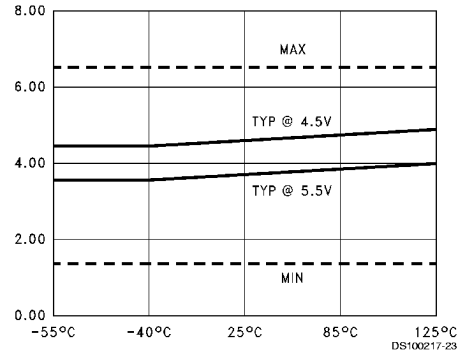
t_{PHZ} vs Temperature (T_A)
C_L = 50 pF, 1 Output Switching



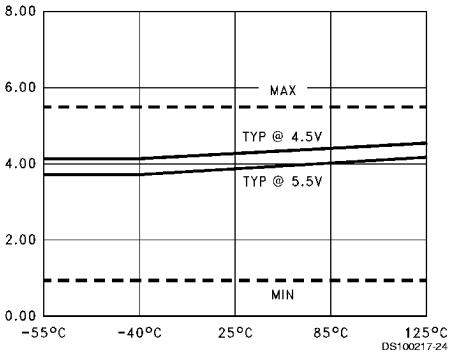
Dashed lines represent design characteristics; for specified guarantees refer to AC Characteristics Table.

Capacitance (Continued)

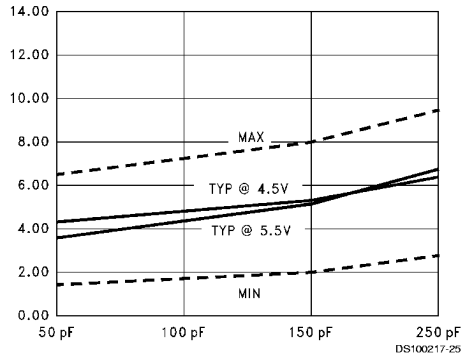
t_{PZH} vs Temperature (T_A)
C_L = 50 pF, 8 Outputs Switching



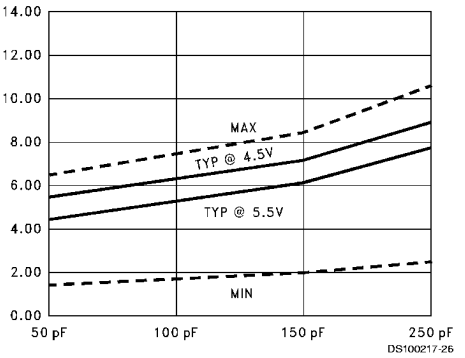
t_{PHZ} vs Temperature (T_A)
C_L = 50 pF, 8 Outputs Switching



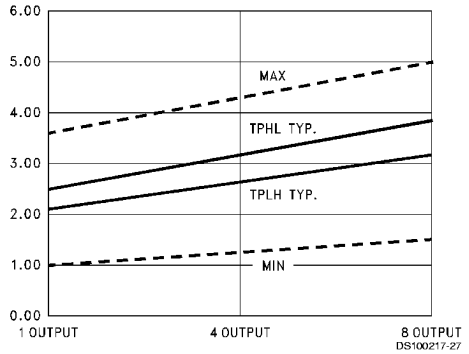
t_{PZH} vs Load Capacitance
8 Outputs Switching, T_A = 25°C



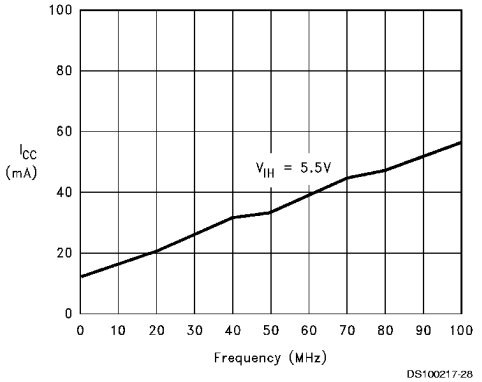
t_{PZL} vs Load Capacitance
8 Outputs Switching, T_A = 25°C



t_{PLH} and t_{PHL} vs Number Outputs Switching
V_{CC} = 5.0V, T_A = 25°C, C_L = 50 pF

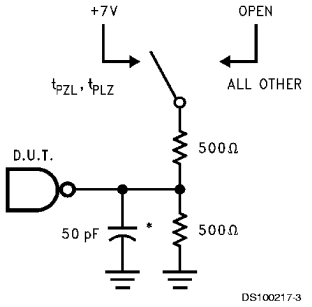


I_{CC} vs Frequency,
Average, T_A = 25°C,
All Outputs Unloaded/Unterminated



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

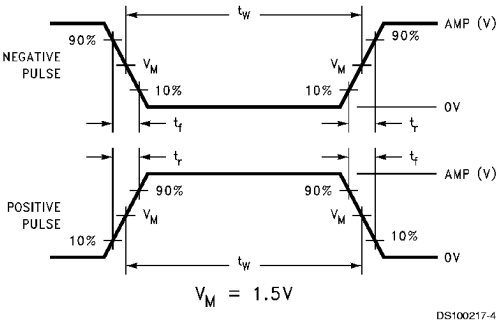


FIGURE 2. Test Input Signal Levels

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

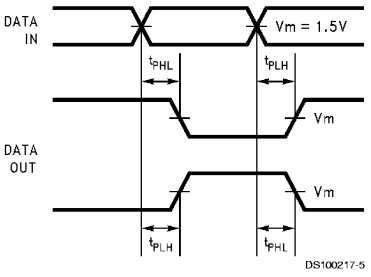


FIGURE 4. Propagation Delay Waveforms for Inverting and Non-Inverting Functions

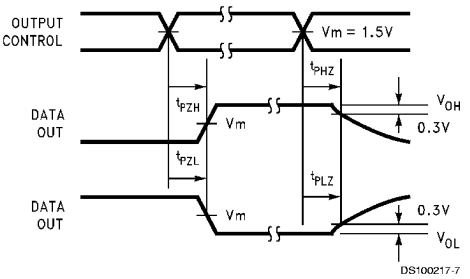
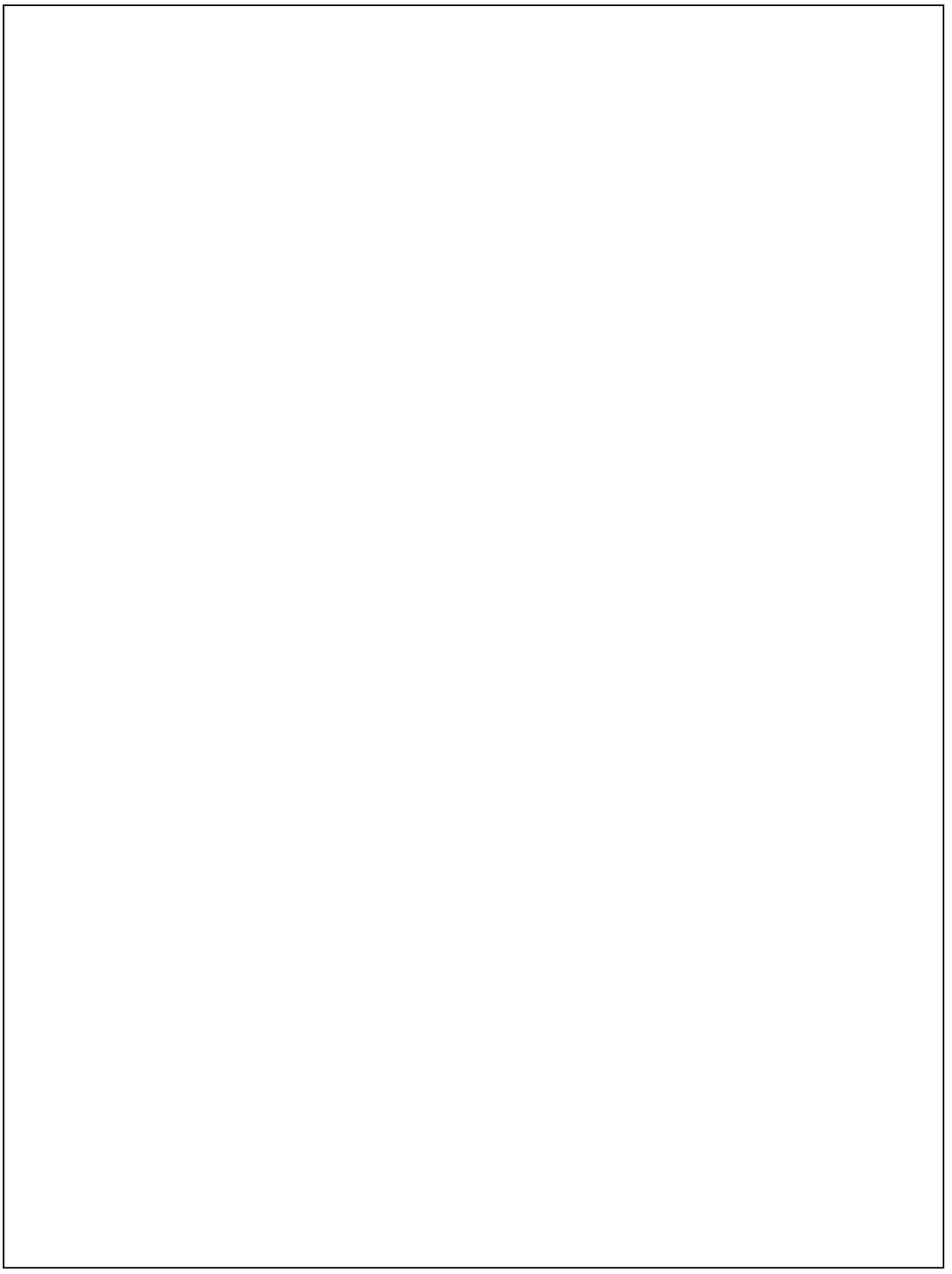
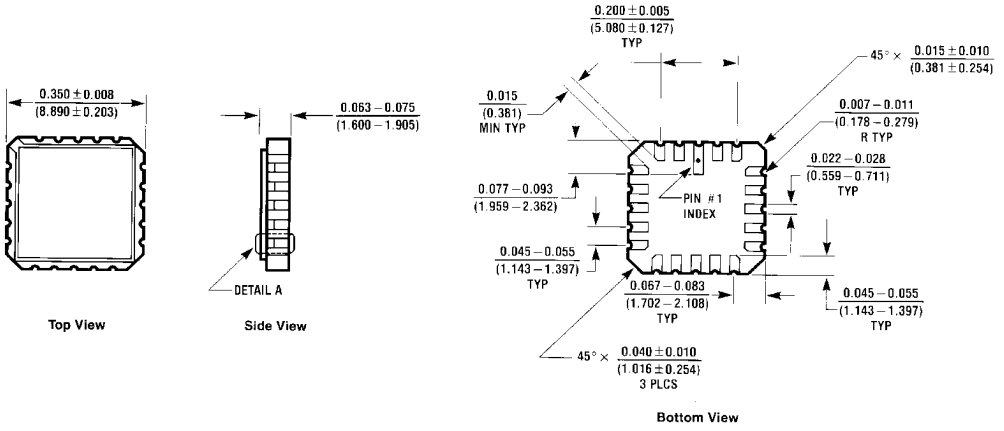
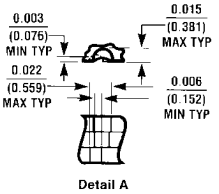


FIGURE 5. TRI-STATE Output HIGH and LOW Enable and Disable Time



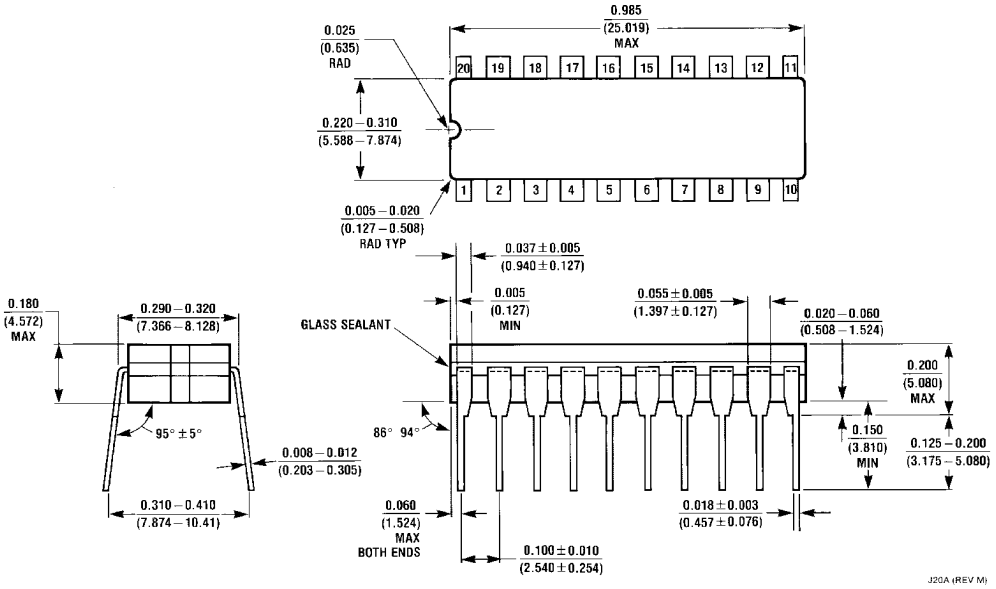
Physical Dimensions inches (millimeters) unless otherwise noted





E20A (REV D)

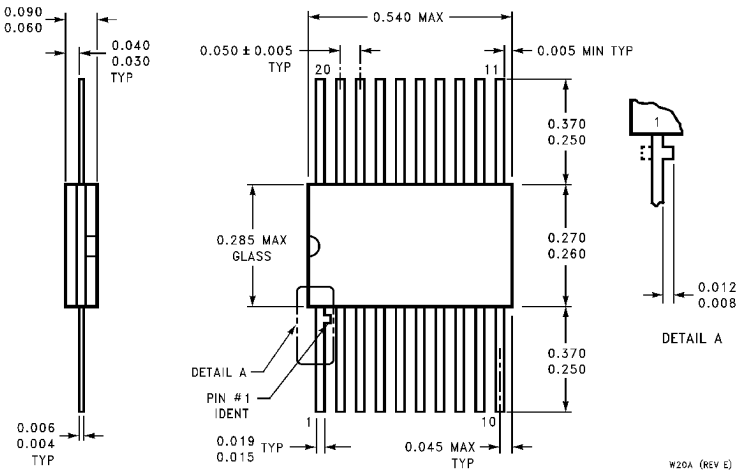
20-Terminal Ceramic Chip Carrier
NS Package Number E20A



J20A (REV M)

20-Lead Ceramic Dual-In-Line Package
NS Package Number J20A

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



20-Lead Ceramic Flatpack
NS Package Number W20A

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2. A critical component in any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

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