

## 54AC541 Octal Buffer/Line Driver with TRI-STATE® Outputs

### General Description

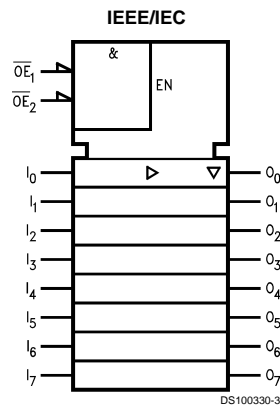
The 'AC541 is an octal buffer/line driver designed to be employed as memory and address drivers, clock drivers and bus oriented transmitter/receivers. The 'AC541 is a noninverting option of the 'AC540.

This device is similar in function to the 'AC244 while providing flow-through architecture (inputs on opposite side from outputs). This pinout arrangement makes this device especially useful as an output port for microprocessors, allowing ease of layout and greater PC board density.

### Features

- $I_{CC}$  and  $I_{OZ}$  reduced by 50%
- TRI-STATE outputs
- Inputs and outputs opposite side of package, allowing easier interface to microprocessors
- Output source/sink 24 mA
- 'AC540 provides inverted outputs
- Standard Military Drawing (SMD)
  - 'AC541: 5962-88706

### Logic Symbol



### Truth Table

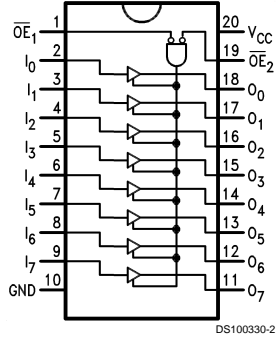
Inputs			Outputs
$\overline{OE}_1$	$\overline{OE}_2$	I	
L	L	H	H
H	X	X	Z
X	H	X	Z
L	L	L	L

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

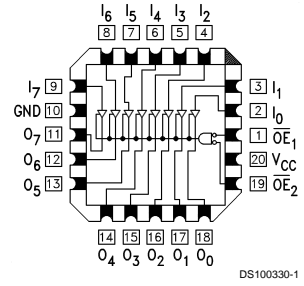
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 FACT™ is a trademark of Fairchild Semiconductor Corporation.

## Connection Diagrams

Pin Assignment  
for DIP and Flatpak



Pin Assignment  
for LCC



## Absolute Maximum Ratings (Note 1)

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

Supply Voltage ( $V_{CC}$ )	-0.5V to +7.0V
DC Input Diode Current ( $I_{IK}$ )	
$V_I = -0.5V$	-20 mA
$V_I = V_{CC} + 0.5V$	+20 mA
DC Input Voltage ( $V_I$ )	-0.5V to $V_{CC} + 0.5V$
DC Output Diode Current ( $I_{OK}$ )	
$V_O = -0.5V$	-20 mA
$V_O = V_{CC} + 0.5V$	+20 mA
DC Output Voltage ( $V_O$ )	-0.5V to $V_{CC} + 0.5V$
DC Output Source or Sink Current ( $I_O$ )	±50 mA
DC $V_{CC}$ or Ground Current per Output Pin ( $I_{CC}$ or $I_{GND}$ )	±50 mA
Storage Temperature ( $T_{STG}$ )	-65°C to +150°C

Junction Temperature ( $T_J$ )

CDIP

175°C

## Recommended Operating Conditions

Supply Voltage ( $V_{CC}$ )	'AC	2.0V to 6.0V
Input Voltage ( $V_I$ )		0V to $V_{CC}$
Output Voltage ( $V_O$ )		0V to $V_{CC}$
Operating Temperature ( $T_A$ )	54AC	-55°C to +125°C
Minimum Input Edge Rate ( $\Delta V/\Delta t$ )	'AC Devices	
	$V_{IN}$ from 30% to 70% of $V_{CC}$	
	$V_{CC}$ @ 3.3V, 4.5V, 5.5V	125 mV/ns

**Note 1:** Absolute maximum ratings are those values beyond which damage to the device may occur. The databook specifications should be met, without exception, to ensure that the system design is reliable over its power supply, temperature, and output/input loading variables. National does not recommend operation of FACT™ circuits outside databook specifications.

## DC Characteristics for 'AC Family Devices

Symbol	Parameter	$V_{CC}$ (V)	54AC		Units	Conditions
			$T_A =$			
			-55°C to +125°C			
			Guaranteed Limits			
$V_{IH}$	Minimum High Level Input Voltage	3.0	2.1		V	$V_{OUT} = 0.1V$ or $V_{CC} - 0.1V$
		4.5	3.15			
		5.5	3.85			
$V_{IL}$	Maximum Low Level Input Voltage	3.0	0.9		V	$V_{OUT} = 0.1V$ or $V_{CC} - 0.1V$
		4.5	1.35			
		5.5	1.65			
$V_{OH}$	Minimum High Level Output Voltage	3.0	2.9		V	$I_{OUT} = -50 \mu A$
		4.5	4.4			
		5.5	5.4			
$V_{OL}$	Maximum Low Level Output Voltage	3.0	2.4		V	(Note 2) $V_{IN} = V_{IL}$ or $V_{IH}$ $I_{OH} = -12 \text{ mA}$ $I_{OH} = -24 \text{ mA}$ $I_{OH} = -24 \text{ mA}$
		4.5	3.7			
		5.5	4.7			
$V_{OL}$	Maximum Low Level Output Voltage	3.0	0.1		V	$I_{OUT} = 50 \mu A$
		4.5	0.1			
		5.5	0.1			
$V_{OL}$	Maximum Low Level Output Voltage	3.0	0.50		V	(Note 2) $V_{IN} = V_{IL}$ or $V_{IH}$ $I_{OL} = 12 \text{ mA}$ $I_{OL} = 24 \text{ mA}$ $I_{OL} = 24 \text{ mA}$
		4.5	0.50			
		5.5	0.50			
$I_{IN}$	Maximum Input Leakage Current	5.5	±1.0		μA	$V_I = V_{CC}, GND$
$I_{OZ}$	Maximum TRI-STATE Leakage Current	5.5	±5.0		μA	$V_I$ (OE) = $V_{IL}, V_{IH}$ $V_I = V_{CC}, GND$ $V_O = V_{CC}, GND$

## DC Characteristics for 'AC Family Devices (Continued)

Symbol	Parameter	V <sub>CC</sub> (V)	54AC		Units	Conditions
			T <sub>A</sub> = -55°C to +125°C			
			Guaranteed Limits			
I <sub>OLD</sub>	Minimum Dynamic Output Current (Note 3)	5.5	50		mA	V <sub>OLD</sub> = 1.65V Max
I <sub>OHD</sub>		5.5	-50		mA	V <sub>OHD</sub> = 3.85V Min
I <sub>CC</sub>	Maximum Quiescent Supply Current	5.5	80.0		μA	V <sub>IN</sub> = V <sub>CC</sub> or GND

**Note 2:** All outputs loaded; thresholds on input associated with output under test.

**Note 3:** Maximum test duration 2.0 ms, one output loaded at a time.

**Note 4:** I<sub>IN</sub> and I<sub>CC</sub> @ 3.0V are guaranteed to be less than or equal to the respective limit @ 5.5V V<sub>CC</sub>.

I<sub>CC</sub> for 54AC @ 25°C is identical to 74AC @ 25°C.

## AC Electrical Characteristics

Symbol	Parameter	V <sub>CC</sub> (V) (Note 5)	54AC		Units	Fig. No.
			T <sub>A</sub> = -55°C to +125°C C <sub>L</sub> = 50 pF			
			Min	Max		
t <sub>PLH</sub>	Propagation Delay Data to Output	3.3	1.0	10.0	ns	
		5.0	1.5	7.0		
t <sub>PHL</sub>	Propagation Delay Data to Output	3.3	1.0	9.5	ns	
		5.0	1.5	7.0		
t <sub>PZH</sub>	Output Enable Time	3.3	1.0	13.5	ns	
		5.0	1.5	10.0		
t <sub>PZL</sub>	Output Enable Time	3.3	1.0	12.5	ns	
		5.0	1.5	9.0		
t <sub>PHZ</sub>	Output Disable Time	3.3	1.0	15.0	ns	
		5.0	1.5	12.0		
t <sub>PLZ</sub>	Output Disable Time	3.3	1.0	11.0	ns	
		5.0	1.5	9.0		

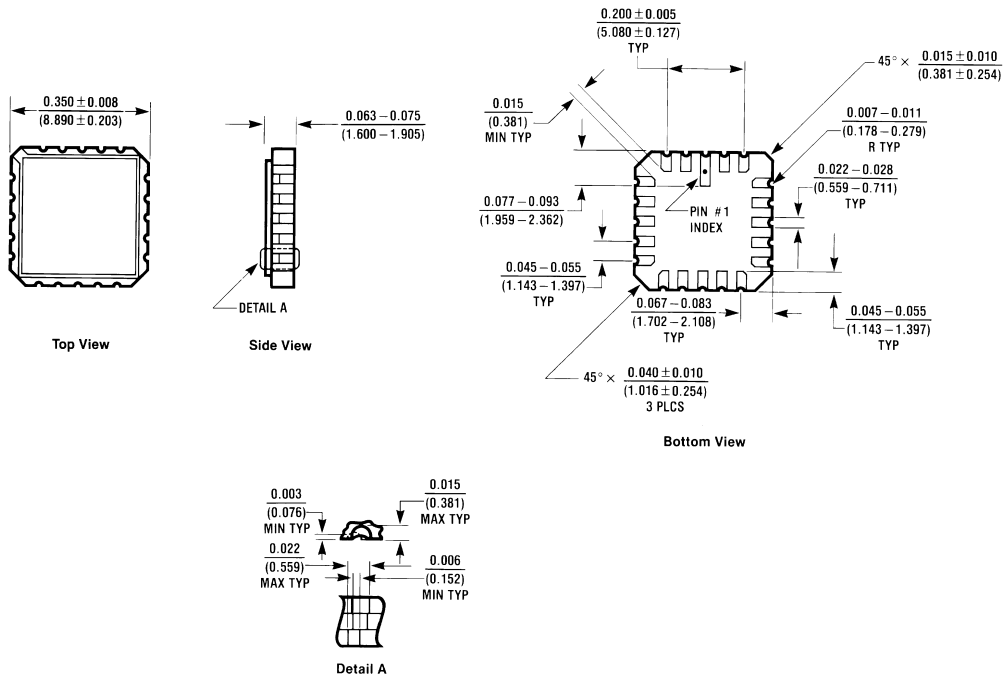
**Note 5:** Voltage Range 3.3 is 3.3V ±0.3V

Voltage Range 5.0 is 5.0V ±0.5V

## Capacitance

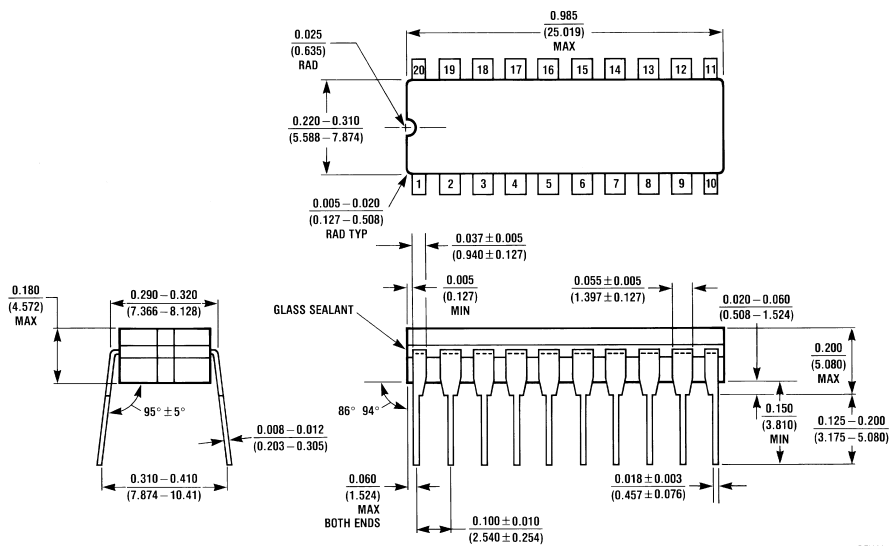
Symbol	Parameter	Typ	Units	Conditions
C <sub>IN</sub>	Input Capacitance	4.5	pF	V <sub>CC</sub> = OPEN
C <sub>PD</sub>	Power Dissipation Capacitance	30.0	pF	V <sub>CC</sub> = 5.0V

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



E20A (REV D)

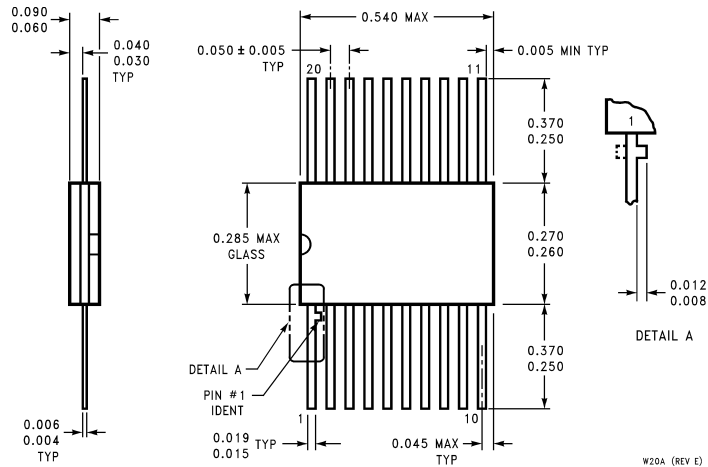
**20 Terminal Ceramic Leadless Chip Carrier (L)**  
NS Package Number E20A



J20A (REV M)

**20 Lead Ceramic Dual-In-Line Package (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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