

August 1998

54AC241 • 54ACT241

Octal Buffer/Line Driver with TRI-STATE® Outputs

General Description

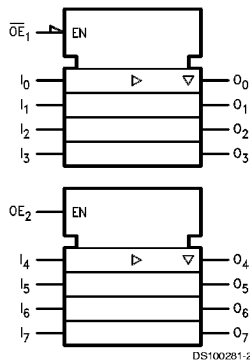
The 'AC/'ACT241 is an octal buffer and line driver designed to be employed as a memory address driver, clock driver and bus-oriented transmitter or receiver which provides improved PC board density.

Features

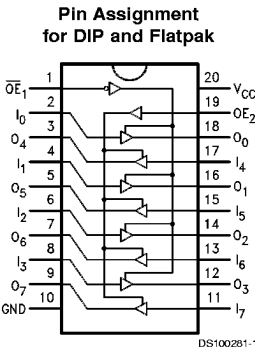
- I_{CC} and I_{OZ} reduced by 50%

- Non-inverting TRI-STATE outputs drive bus lines or buffer memory address registers
- Outputs source/sink 24 mA
- 'ACT241 has TTL-compatible inputs
- Standard Microcircuit Drawing (SMD)
 - 'AC241: 5962-87551
 - 'ACT241: 5962-89847

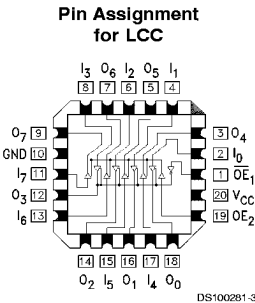
Logic Symbol



Connection Diagrams



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



TRI-STATE® is a registered trademark of National Semiconductor Corporation.
FACT® is a registered trademark of Fairchild Semiconductor Corporation.

Truth Tables

Inputs		Outputs (Pins 12, 14, 16, 18)
$\overline{OE}_1$	I_n	
L	L	L
L	H	H
H	X	Z

Inputs		Outputs (Pins 3, 5, 7, 9)
OE_2	I_n	
H	L	L
H	H	H
L	X	Z

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

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
'ACT	4.5V to 5.5V
Input Voltage (V_I)	0V to V_{CC}
Output Voltage (V_O)	0V to V_{CC}
Operating Temperature (T_A)	
54AC/ACT	-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
Minimum Input Edge Rate ($\Delta V/\Delta t$)	
'ACT Devices	
V_{IN} from 0.8V to 2.0V	
V_{CC} @ 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 μA
		4.5	4.4		
		5.5	5.4		
	(Note 2) V _{IN} = V _{IL} or V _{IH} I _{OH} = −12 mA I _{OH} = −24 mA I _{OH} = −24 mA	3.0	2.4	V	
		4.5	3.7		
		5.5	4.7		
		5.5	4.7		
V _{OL}	Maximum Low Level Output Voltage	3.0	0.1	V	I _{OUT} = 50 μA
		4.5	0.1		
		5.5	0.1		
	(Note 2) V _{IN} = V _{IL} or V _{IH} I _{OL} = 12 mA I _{OL} = 24 mA I _{OL} = 24 mA	3.0	0.50	V	
		4.5	0.50		
		5.5	0.50		
		5.5	0.50		
I _{IN}	Maximum Input Leakage Current	5.5	±1.0	μA	V _I = V _{CC} , GND

DC Characteristics for 'AC Family Devices (Continued)					
Symbol	Parameter	V _{CC} (V)	54AC	Units	Conditions
			T _A = –55° C to +125° C		
			Guaranteed Limits		
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
I _{OLD}	Minimum Dynamic	5.5	50	mA	V _{OLD} = 1.65V Max
I _{OHD}	Output Current (Note 3)	5.5	–50	mA	V _{OHD} = 3.85V Min
I _{CC}	Maximum Quiescent Supply Current	5.5	80.0	μA	V _{IN} = V _{CC} 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_{IN} and I_{CC} @ 3.0V are guaranteed to be less than or equal to the respective limit @ 5.5V V_{CC}. I_{CC} for 54AC @ 25°C is identical to 74AC @ 25°C.					
DC Characteristics for 'ACT Family Devices					
Symbol	Parameter	V _{CC} (V)	54ACT	Units	Conditions
			T _A = –55° C to +125° C		
			Guaranteed Limits		
V _{IH}	Minimum High Level Input Voltage	4.5 5.5	2.0 2.0	V	V _{OUT} = 0.1V or V _{CC} – 0.1V
V _{IL}	Maximum Low Level Input Voltage	4.5 5.5	0.8 0.8	V	V _{OUT} = 0.1V or V _{CC} – 0.1V
V _{OH}	Minimum High Level Output Voltage	4.5 5.5	4.4 5.4	V	I _{OUT} = –50 μA
		4.5 5.5	3.70 4.70	V	(Note 5) V _{IN} = V _{IL} or V _{IH} I _{OH} = –24 mA I _{OH} = –24 mA
		4.5 5.5	0.1 0.1	V	I _{OUT} = 50 μA
V _{OL}	Maximum Low Level Output Voltage	4.5 5.5	0.1 0.1	V	I _{OUT} = 50 μA
		4.5 5.5	0.50 0.50	V	(Note 5) V _{IN} = V _{IL} or V _{IH} I _{OL} = 24 mA I _{OL} = 24 mA
		4.5 5.5	0.50 0.50	V	I _{OL} = 24 mA
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 = V _{IL} , V _{IH} V _O = V _{CC} , GND
I _{CC} T	Maximum I _{CC} /Input	5.5	1.6	mA	V _I = V _{CC} – 2.1V
I _{OLD}	Minimum Dynamic	5.5	50	mA	V _{OLD} = 1.65V Max
I _{OHD}	Output Current (Note 6)	5.5	–50	mA	V _{OHD} = 3.85V Min
I _{CC}	Maximum Quiescent Supply Current	5.5	80.0	μA	V _{IN} = V _{CC} or GND
Note 5: All outputs loaded; thresholds on input associated with output under test. Note 6: Maximum test duration 2.0 ms, one output loaded at a time. Note 7: I_{CC} for 54ACT @ 25°C is identical to 74ACT @ 25°C.					

AC Electrical Characteristics

Symbol	Parameter	V _{CC} (V) (Note 8)	54AC		Units
			T _A = -55°C to +125°C C _L = 50 pF		
			Min	Max	
t _{PLH}	Propagation Delay	3.3	1.0	12.0	ns
	Data to Output	5.0	1.0	9.5	
t _{PHL}	Propagation Delay	3.3	1.0	11.5	ns
	Data to Output	5.0	1.0	9.0	
t _{PZH}	Output Enable Time	3.3	1.0	13.0	ns
		5.0	1.0	10.0	
t _{PZL}	Output Enable Time	3.3	1.0	13.0	ns
		5.0	1.0	10.0	
t _{PHZ}	Output Disable Time	3.3	1.0	13.0	ns
		5.0	1.0	11.5	
t _{PLZ}	Output Disable Time	3.3	1.0	13.0	ns
		5.0	1.0	11.5	

Note 8: Voltage Range 3.3 is 3.3V ±3.3V
Voltage Range 5.0 is 5.0V ±0.5V

AC Electrical Characteristics

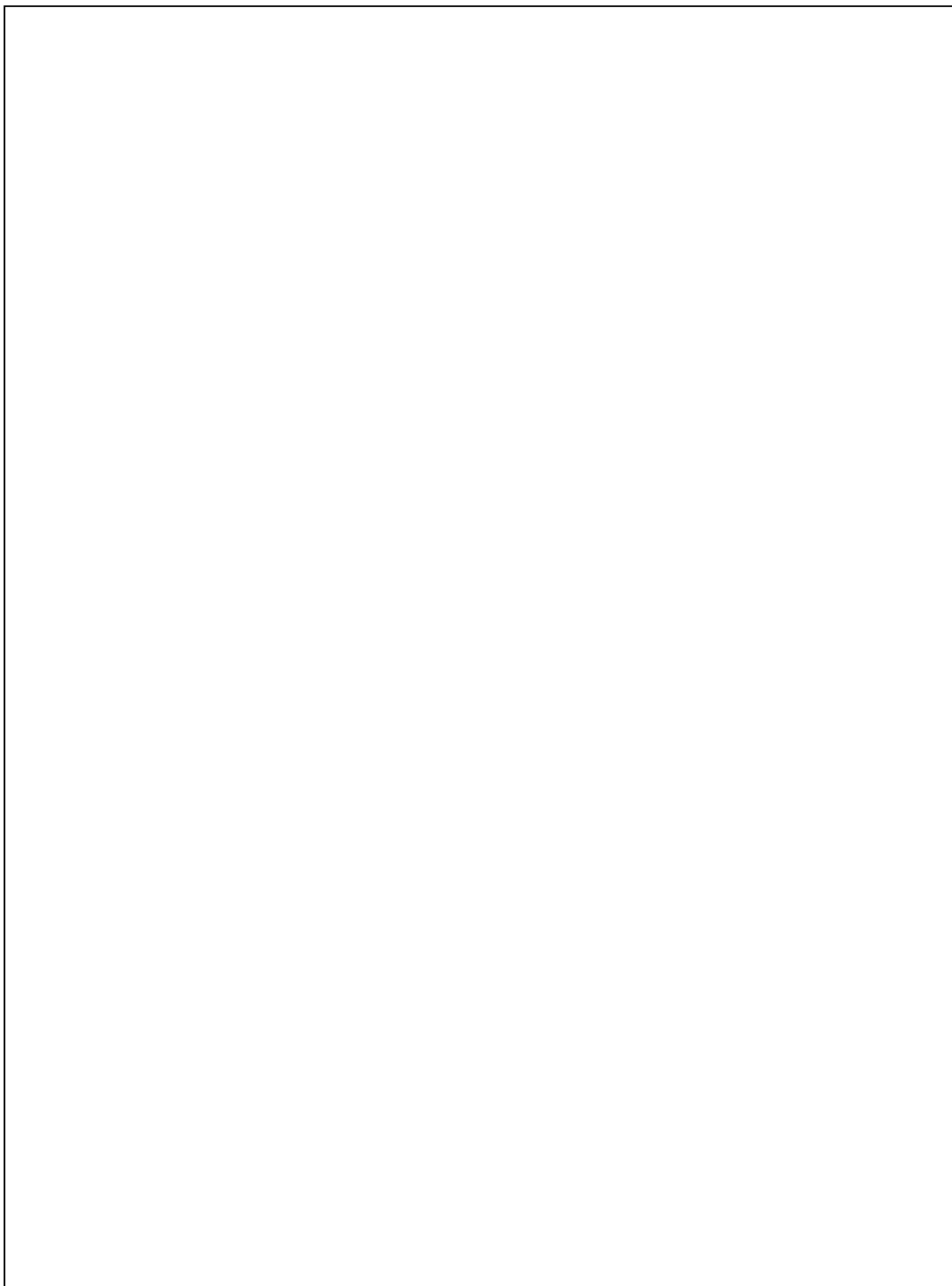
Symbol	Parameter	V _{CC} (V) (Note 9)	54ACT		Units
			T _A = −55°C to +125°C C _L = 50 pF		
			Min	Max	
t _{PLH}	Propagation Delay Data to Output	5.0	1.0	10.0	ns
t _{PHL}	Propagation Delay Data to Output	5.0	1.0	10.0	ns
t _{PZH}	Output Enable Time	5.0	1.0	11.5	ns
t _{PZL}	Output Enable Time	5.0	1.0	12.5	ns
t _{PHZ}	Output Disable Time	5.0	1.0	12.5	ns
t _{PLZ}	Output Disable Time	5.0	1.0	12.5	ns

Note 9: Voltage Range 5.0 is 5.0V ±0.5V

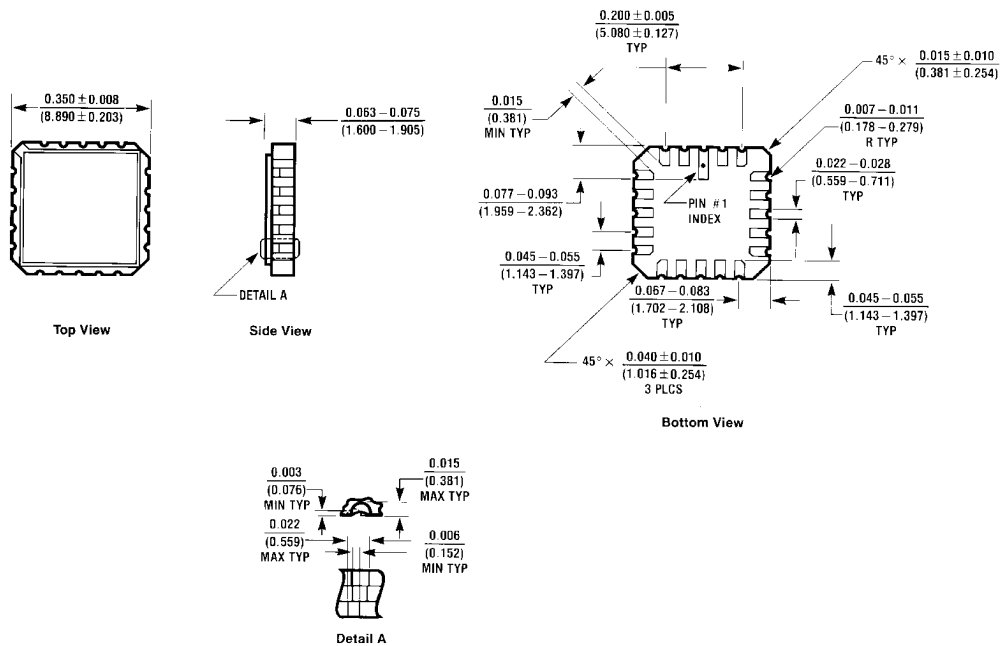
Capacitance

Symbol	Parameter	Typ	Units	Conditions
C _{IN}	Input Capacitance	4.5	pF	V _{CC} = OPEN
C _{PD}	Power Dissipation Capacitance	45.0	pF	V _{CC} = 5.0V

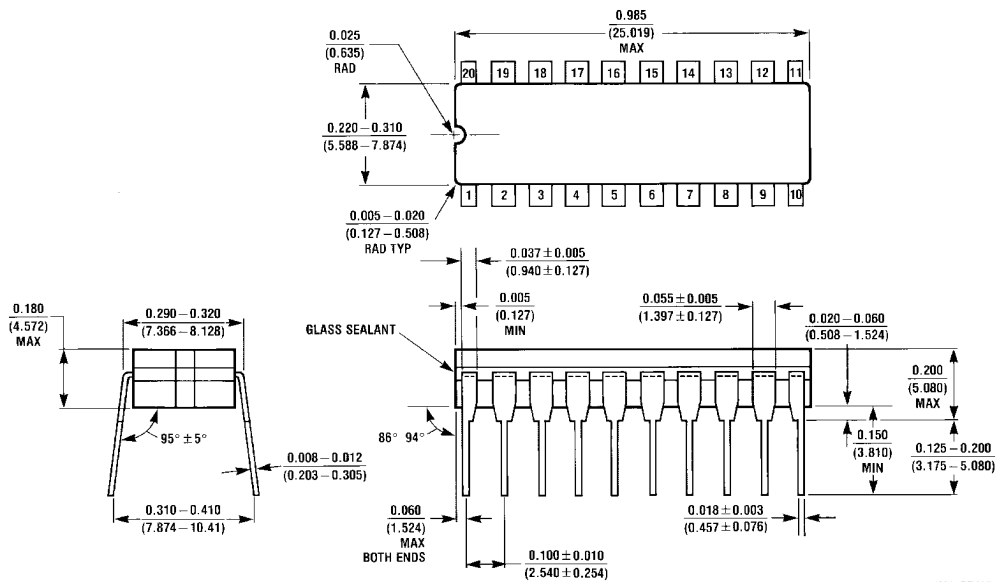
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Physical Dimensions inches (millimeters) unless otherwise noted

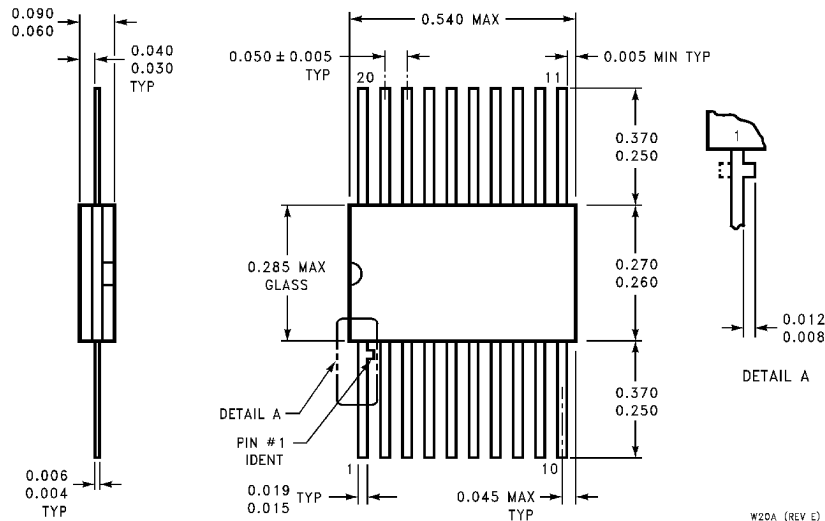


20 Terminal Ceramic Leadless Chip Carrier (L)
NS Package Number E20A



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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