T-52-09

National Semiconductor

54AC/74AC540
Octal Buffer/Line Driver with TRI-STATE® Outputs

General Description

The 'AC540 is an octal buffer/line drivers designed to be employed as memory and address drivers, clock drivers and bus oriented transmitter/receivers.

These devices are similar in function to the 'AC240 while providing flow-through architecture (inputs on opposite side from outputs). This pinout arrangement makes these devices especially useful as output ports for microprocessors, allowing ease of layout and greater PC board density.

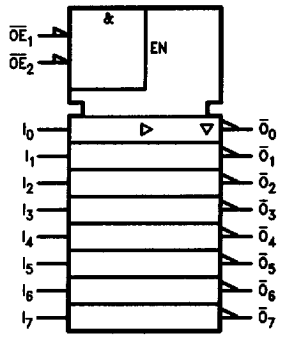
Features

- I_{CC} and I_{OZ} reduced by 50%
- TRI-STATE inverting outputs
- Inputs and outputs opposite side of package, allowing easier interface to microprocessors
- Output source/sink 24 mA
- Standard Military Drawing 54AC540: 5962-8769501

Ordering Code: See Section 8

Logic Symbol

IEEE/IEC



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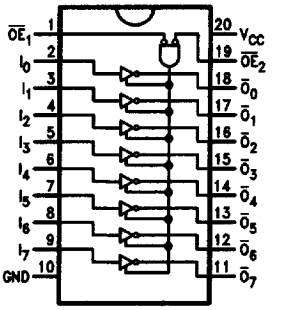
Connection Diagrams

Pin Assignment for DIP, Flatpak and SOIC



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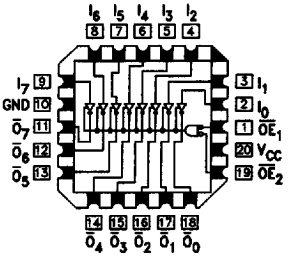
Pin Assignment for LCC



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Truth Table

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

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

Absolute Maximum Rating (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
PDIP	140°C

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

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)	
74AC	−40°C to +85°C
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

DC Characteristics for 'AC Family Devices

Symbol	Parameter	V_{CC} (V)	74AC T_A = +25°C	54AC T_A = −55°C to +125°C	74AC T_A = −40°C to +85°C	Units	Conditions
			Typ	Guaranteed Limits			
V_{IH}	Minimum High Level Input Voltage	3.0	1.5	2.1	2.1	V	V_{OUT} = 0.1V or V_{CC} − 0.1V
		4.5	2.25	3.15	3.15		
		5.5	2.75	3.85	3.85		
V_{IL}	Maximum Low Level Input Voltage	3.0	1.5	0.9	0.9	V	V_{OUT} = 0.1V or V_{CC} − 0.1V
		4.5	2.25	1.35	1.35		
		5.5	2.75	1.65	1.65		
V_{OH}	Minimum High Level Output Voltage	3.0	2.99	2.9	2.9	V	I_{OUT} = −50 μA
		4.5	4.49	4.4	4.4		
		5.5	5.49	5.4	5.4		
		3.0		2.56	2.4	V	*V_{IN} = V_{IL} or V_{IH} I_{OH} −12 mA
		4.5		3.86	3.7		I_{OH} −24 mA
		5.5		4.86	4.7		−24 mA
V_{OL}	Maximum Low Level Output Voltage	3.0	0.002	0.1	0.1	V	I_{OUT} = 50 μA
		4.5	0.001	0.1	0.1		
		5.5	0.001	0.1	0.1		
		3.0		0.36	0.50	V	*V_{IN} = V_{IL} or V_{IH} 12 mA
		4.5		0.36	0.50		I_{OL} 24 mA
		5.5		0.36	0.50		24 mA
I_{IN}	Maximum Input Leakage Current	5.5		±0.1	±1.0	μA	V_I = V_{CC}, GND

*All outputs loaded, thresholds on input associated with output under test.

DC Characteristics for 'AC Family Devices (Continued)

Symbol	Parameter	V_{CC} (V)	74AC T_A = +25°C	54AC T_A = −55°C to +125°C	74AC T_A = −40°C to +85°C	Units	Conditions
			Typ	Guaranteed Limits			
I_{OZ}	Maximum TRI-STATE® Current	5.5		±0.25	±5.0	±2.5	µA	V_I (OE) = V_{IL}, V_{IH} V_I = V_{CC}, GND V_O = V_{CC}, GND
I_{OLD}	†Minimum Dynamic Output Current	5.5			50	75	mA	V_{OLD} = 1.65V Max
I_{OHD}		5.5			−50	−75	mA	V_{OHD} = 3.85V Min
I_{CC}	Maximum Quiescent Supply Current	5.5		4.0	80.0	40.0	µA	V_{IN} = V_{CC} or GND

†Maximum test duration 2.0 ms, one output loaded at a time.

Note: 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.

AC Electrical Characteristics: See Section 2 for Waveforms

Symbol	Parameter	V_{CC}* (V)	74AC T_A = +25°C, C_L = 50 pF			54AC T_A = −55°C to +125°C, C_L = 50 pF		74AC T_A = −40°C to +85°C, C_L = 50 pF		Units	Fig. No.
			Min	Typ	Max	Min	Max	Min	Max		
t_{PLH}	Propagation Delay Data to Output	3.3 5.0	1.5 1.5	5.5 4.0	7.5 6.0	1.0 1.5	9.0 7.0	1.0 1.0	8.0 6.5	ns	2-3, 4
t_{PHL}	Propagation Delay Data to Output	3.3 5.0	1.5 1.5	5.0 4.0	7.0 5.5	1.0 1.5	8.0 6.5	1.0 1.0	7.5 6.0	ns	2-3, 4
t_{PZH}	Output Enable Time	3.3 5.0	3.0 2.0	8.5 6.5	11.0 8.5	1.0 1.5	13.0 10.0	2.5 2.0	12.0 9.5	ns	2-5
t_{PZL}	Output Enable Time	3.3 5.0	2.5 2.0	7.5 6.0	10.0 7.5	1.0 1.5	12.0 9.0	2.0 1.5	11.0 8.5	ns	2-6
t_{PHZ}	Output Disable Time	3.3 5.0	2.5 1.5	8.5 7.5	13.0 10.5	1.0 1.5	15.5 12.0	1.5 1.0	14.0 11.0	ns	2-5
t_{PLZ}	Output Disable Time	3.3 5.0	2.5 1.5	7.0 6.0	10.0 8.0	1.0 1.5	12.0 10.0	2.0 1.5	11.0 9.0	ns	2-6

*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_{IN}	Input Capacitance	4.5	pF	V_{CC} = OPEN
C_{PD}	Power Dissipation Capacitance	30.0	pF	V_{CC} = 5.0V