54AC245,54ACT245

54AC245 54ACT245 Octal Bidirectional Transceiver with TRI-STATE Inputs/Outputs

Literature Number: SNOS099

National Semiconductor

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54AC245 • 54ACT245
Octal Bidirectional Transceiver with TRI-STATE® Inputs/Outputs

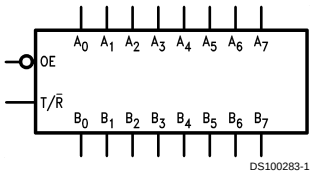
General Description

The 'AC/'ACT245 contains eight non-inverting bidirectional buffers with TRI-STATE outputs and is intended for bus-oriented applications. Current sinking capability is 24 mA at both the A and B ports. The Transmit/Receive ($T/\overline{R}$) input determines the direction of data flow through the bidirectional transceiver. Transmit (active-HIGH) enables data from A ports to B ports; Receive (active-LOW) enables data from B ports to A ports. The Output Enable input, when HIGH, disables both A and B ports by placing them in a HIGH Z condition.

Features

- I_{CC} and I_{OZ} reduced by 50%
- Noninverting buffers
- Bidirectional data path
- A and B outputs source/sink 24 mA
- 'ACT245 has TTL-compatible inputs
- Standard Microcircuit Drawing (SMD)
  - — 'AC245: 5962-87758
  - — 'ACT245: 5962-87663

Logic Symbols



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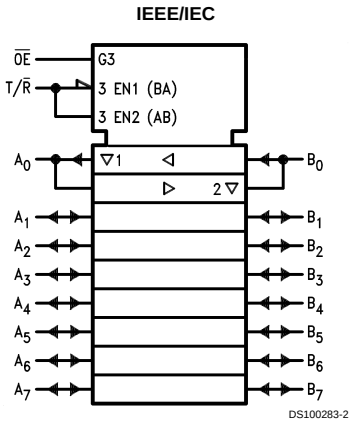

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Pin Names	Description
$\overline{OE}$	Output Enable Input
$T/\overline{R}$	Transmit/Receive Input
A_0–A_7	Side A TRI-STATE Inputs or TRI-STATE Outputs
B_0–B_7	Side B TRI-STATE Inputs or TRI-STATE Outputs

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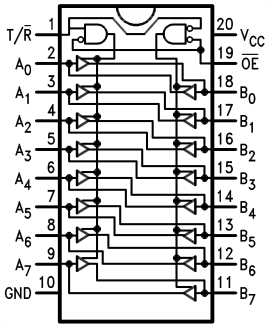
Connection Diagrams

Pin Assignment for DIP and Flatpak



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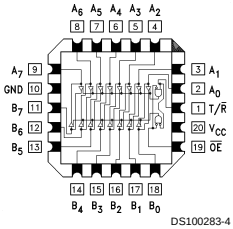
Pin Assignment for LCC



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Truth Table

Inputs		Outputs
$\overline{OE}$	T/$\overline{R}$	
L	L	Bus B Data to Bus A
L	H	Bus A Data to Bus B
H	X	HIGH-Z State

H = HIGH Voltage Level
L = LOW Voltage Level
X = Immaterial

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 T_A = −55˚C to +125˚C Guaranteed Limits	Units	Conditions
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}
		3.0	2.4	V	−12 mA
		4.5	3.7		I_{OH} −24 mA
		5.5	4.7		−24 mA
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}
		3.0	0.50	V	12 mA
		4.5	0.50		I_{OL} 24 mA
		5.5	0.50		24 mA
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 T_A = −55˚C to +125˚C Guaranteed Limits	Units	Conditions
I_{OLD}	(Note 3) Minimum Dynamic Output Current	5.5	50	mA	V_{OLD} = 1.65V Max
I_{OHD}		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
I_{OZT}	Maximum I/O Leakage Current	5.5	±5.5	µA	V_I(OE) = V_{IL}, V_{IH} V_I = V_{CC}, GND V_O = V_{CC}, 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 T_A = −55˚C to +125˚C Guaranteed Limits	Units	Conditions
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
					(Note 5) V_{IN} = V_{IL} or V_{IH}
		4.5 5.5	3.70 4.70	V	I_{OH} −24 mA −24 mA
V_{OL}	Maximum Low Level Output Voltage	4.5 5.5	0.1 0.1	V	I_{OUT} = 50 µA
					(Note 5) V_{IN} = V_{IL} or V_{IH}
		4.5 5.5	0.50 0.50	V	I_{OL} 24 mA 24 mA
I_{IN}	Maximum Input Leakage Current	5.5	±1.0	µA	V_I = V_{CC}, GND
I_{CCT}	Maximum I_{CC}/Input	5.5	1.6	mA	V_I = V_{CC} − 2.1V
I_{OLD}	(Note 6) Minimum Dynamic Output Current	5.5	50	mA	V_{OLD} = 1.65V Max
I_{OHD}		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

DC Characteristics for 'ACT Family Devices (Continued)

Symbol	Parameter	V_{CC} (V)	54ACT T_A = −55°C to +125°C Guaranteed Limits	Units	Conditions
I_{OZT}	Maximum I/O Leakage Current	5.5	±5.0	µA	V_I (OE) = V_{IL}, V_{IH} V_I = V_{CC}, GND V_O = V_{CC}, 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 T_A = −55°C to +125°C C_L = 50 pF Min	54AC Max	Units	Fig. No.
t_{PLH}	Propagation Delay	3.3	1.0	11.5	ns	
	A_n to B_n or B_n to A_n	5.0	1.0	8.5		
t_{PHL}	Propagation Delay	3.3	1.0	10.0	ns	
	A_n to B_n or B_n to A_n	5.0	1.0	7.5		
t_{PZH}	Output Enable Time	3.3	1.0	13.5	ns	
		5.0	1.0	10.0		
t_{PZL}	Output Enable Time	3.3	1.0	14.5	ns	
		5.0	1.0	10.5		
t_{PHZ}	Output Disable Time	3.3	1.0	13.5	ns	
		5.0	1.0	10.5		
t_{PLZ}	Output Disable Time	3.3	1.0	14.0	ns	
		5.0	1.0	10.5		

Note 8: Voltage Range 3.3 is 3.3V ±0.3V
Voltage Range 5.0 is 5.0V ±0.5V

AC Electrical Characteristics

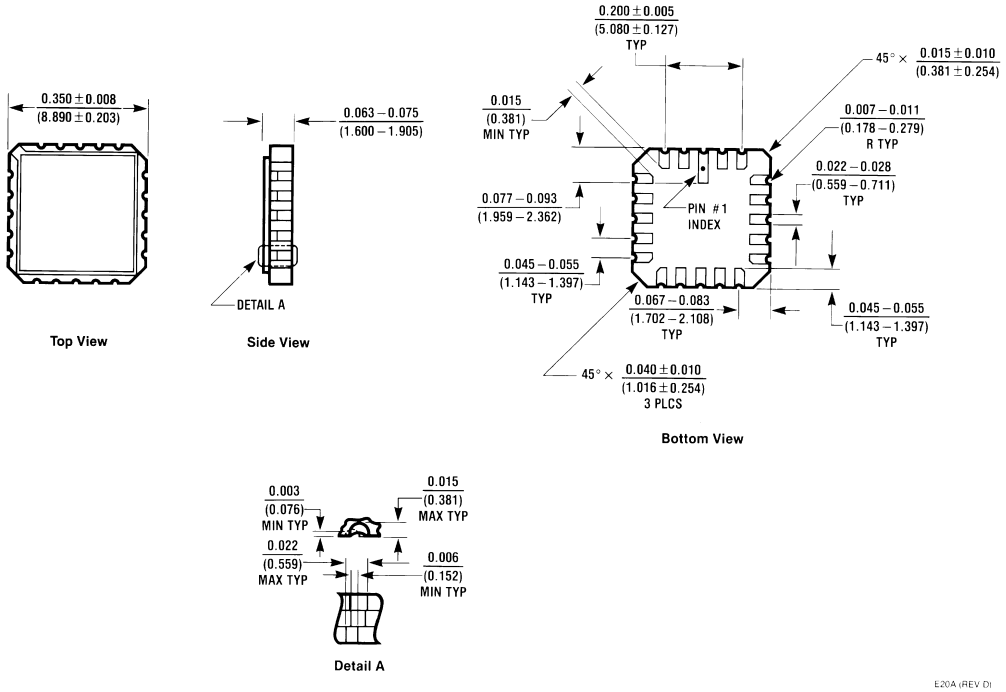
Symbol	Parameter	V_{CC} (V) (Note 9)	54ACT T_A = −55°C to +125°C C_L = 50 pF Min	54ACT Max	Units
t_{PLH}	Propagation Delay	5.0	1.0	9.0	ns
	A_n to B_n or B_n to A_n				
t_{PHL}	Propagation Delay	5.0	1.0	10.0	ns
	A_n to B_n or B_n to A_n				
t_{PZH}	Output Enable Time	5.0	1.0	12.0	ns
t_{PZL}	Output Enable Time	5.0	1.0	13.0	ns
t_{PHZ}	Output Disable Time	5.0	1.0	12.0	ns
t_{PLZ}	Output Disable Time	5.0	1.0	12.0	ns

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

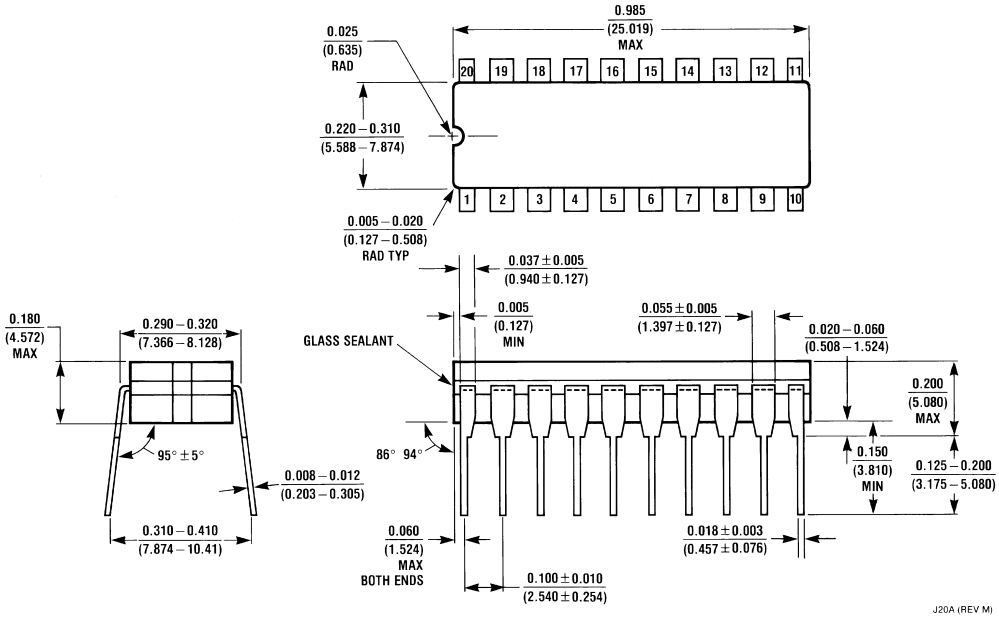
Capacitance

Symbol	Parameter	Typ	Units	Conditions
C_{IN}	Input Capacitance	4.5	pF	V_{CC} = OPEN
$C_{I/O}$	Input/Output Capacitance	15.0	pF	V_{CC} = 5.0V
C_{PD}	Power Dissipation Capacitance	45.0	pF	V_{CC} = 5.0V

Physical Dimensions inches (millimeters) unless otherwise noted

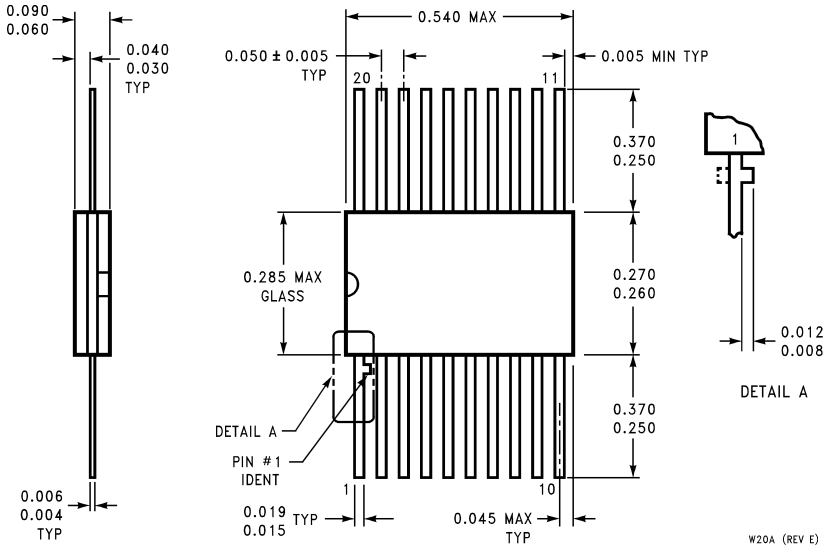


20 Terminal Ceramic Leadless Chip Carrier (L)
NS Package Number E20A



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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