

54BCT/74BCT245

Octal Bidirectional Transceiver with TRI-STATE® Outputs

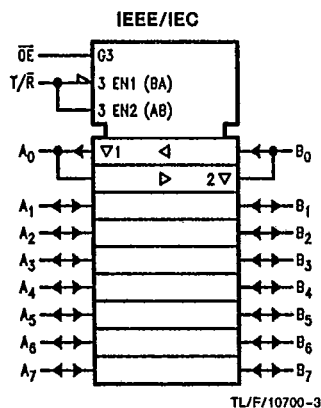
General Description

The 54BCT245 contains eight non-inverting bidirectional buffers with TRI-STATE outputs and is intended for bus-oriented applications. Current sinking capability is 64 mA (48 mA Mil) at the B port. The Transmit/Receive ($T/\bar{R}$) 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 ($\bar{OE}$) input, when HIGH, disables both A and B ports by placing them in a high impedance state.

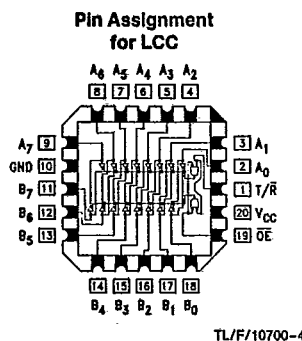
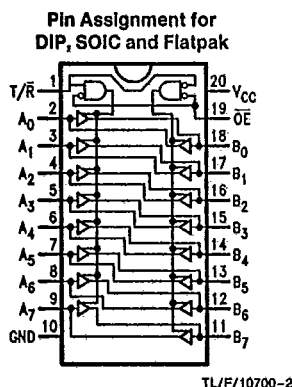
Features

- Non-inverting buffers
- Bidirectional data path
- Low I_{CCZ} through BiCMOS techniques
- TRI-STATE outputs drive bus lines
- Output sink capability of 64 mA
- Source capability of 15 mA
- Guaranteed output skew
- Guaranteed multiple output switching specifications
- Guaranteed 4000V minimum ESD protection
- Guaranteed latchup protection
- Nondestructive hot insertion capability
- High impedance in power down (I_{ZZ} and V_{ID})

Logic Symbol



Connection Diagrams



Truth Table

Inputs		Output
$\bar{OE}$	$T/\bar{R}$	
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

Pin Names	Description
$\bar{OE}$	Output Enable Input (Active Low)
$T/\bar{R}$	Transmit/Receive Input
A_0-A_7	Inputs or TRI-STATE Outputs
B_0-B_7	Inputs or TRI-STATE Outputs

9000-2713

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Absolute Maximum Ratings (Note 1)

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

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
Plastic	-55°C to +150°C

V _{CC} Pin Potential to Ground Pin	-0.5V to +7.0V
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Input Voltage (Note 2)	-0.5V to +7.0V
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Input Current (Note 2)	-30 mA to +5.0 mA
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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.

Voltage Applied to Any Output

In the Disable 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)
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ESD Last Passing Voltage (Min)	4000V
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DC Latchup Source Current	500 mA
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Over Voltage Latchup	V _{CC} + 4.5V
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Recommended Operating Conditions

Free Air Ambient Temperature

Military	-55°C to +125°C
Commercial	0°C to +70°C

Supply Voltage

Military	+4.5V to +5.5V
Commercial	+4.5V to +5.5V

DC Electrical Characteristics

Symbol	Parameter	54BCT/74BCT			Units	V _{CC}	Conditions
		Min	Typ	Max			
V _{IH}	Input HIGH Voltage	2.0			V		Recognized as a HIGH Signal
V _{IL}	Input LOW Voltage			0.8	V		Recognized as a LOW Signal
V _{CD}	Input Clamp Diode Voltage			-1.2	V	Min	I _{IN} = -18 mA
V _{OH}	Output HIGH Voltage	54BCT/74BCT	2.5		V	Min	I _{OH} = -1 mA (An)
		54BCT/74BCT	2.4				I _{OH} = -3 mA (An, Bn)
		54BCT	2.0				I _{OH} = -12 mA (Bn)
		74BCT	2.0				I _{OH} = -15 mA (Bn)
V _{OL}	Output LOW Voltage	54BCT		0.5	V	Min	I _{OL} = 20 mA (An)
		74BCT		0.5			I _{OL} = 24 mA (An)
		54BCT		0.55			I _{OL} = 48 mA (Bn)
		74BCT		0.55			I _{OL} = 64 mA (Bn)
I _{IH}	Input HIGH Current			5	μA	Max	V _{IN} = 2.7V (OE, T/R)
I _{BVI}	Input HIGH Current Breakdown Test			7	μA	Max	V _{IN} = 7.0V (OE, T/R)
I _{BVIT}	Input HIGH Current Breakdown Test (I/O)			100	μA	Max	V _{IN} = 5.5V (An, Bn)
I _{IL}	Input LOW Current			-250	μA	Max	V _{IN} = 0.5V (OE, T/R)
I _{OS}	Output Short-Circuit Current	-100		-225	mA	Max	V _{OUT} = 0V (Bn)
		-60		-150	mA	Max	V _{OUT} = 0V (An)
I _{IH} + I _{OZH}	Output Leakage Current			25	μA	Max	V _{OUT} = 2.7V (An, Bn)
I _{IL} + I _{OZL}	Output Leakage Current			-150	μA	Max	V _{OUT} = 0.5V (An, Bn)
I _{CEX}	Output High Leakage Current			50	μA	Max	V _{OUT} = V _{CC} (An, Bn)
V _{ID}	Input Leakage Test	4.75			V	0.0	I _{ID} = 1.9 μA All Other Pins Grounded
I _{ZZ}	Bus Drainage Test			100	μA	0.0	V _{OUT} = 5.25V (An, Bn)
I _{CCH}	Power Supply Current		19.4	40	mA	Max	V _O = HIGH
I _{CCL}	Power Supply Current		42.5	70	mA	Max	V _O = LOW
I _{CCZ}	Power Supply Current		10	15	mA	Max	V _O = HIGH Z

AC Electrical Characteristics

T-52-30-07

Symbol	Parameter	54BCT/74BCT			54BCT		74BCT		Units	Fig. No.
		$T_A = +25^{\circ}\text{C}$ $V_{CC} = +5.0\text{V}$ $C_L = 50\text{ pF}$			$T_A = \text{MII}$ $V_{CC} = \text{MII}$ $C_L = 50\text{ pF}$		$T_A = \text{Com}$ $V_{CC} = \text{Com}$ $C_L = 50\text{ pF}$			
		Min	Typ	Max	Min	Max	Min	Max		
t_{PLH} t_{PHL}	Propagation Delay Data to Output	1.0	2.7	6.0			1.0	7.0	ns	◆-3
t_{pZH} t_{pZL}	Output Enable Time	1.5	6.6	9.4			1.5	10.9	ns	◆-5
t_{PHZ} t_{PLZ}	Output Disable Time	1.5	3.9	8.3			1.5	9.3	ns	◆-5
t_{OSHL} (Note 1)	Pin to Pin Skew HL Data to Output			1.2				1.3	ns	
t_{OSLH} (Note 1)	Pin to Pin Skew LH Data to Output			0.9				1.0	ns	
t_{OST} (Note 1)	Pin to Pin Skew LH/HL Data to Output			1.8				2.2	ns	
t_{PV} (Note 2)	Device to Device Skew LH/HL Data to Output			4.6				5.0	ns	

Note 1: Skew is defined as the absolute value of the difference between the actual propagation delays for any two separate outputs of the same device. The specification applies to any outputs switching HIGH to LOW (t_{OSHL}), LOW to HIGH (t_{OSLH}), or any combination switching LOW to HIGH and/or HIGH to LOW (t_{OST}). This specification is guaranteed but not tested.

Note 2: Propagation delay variation for a given set of conditions (i.e., temperature and V_{CC}) from device to device. This specification is guaranteed but not tested.

Extended AC Electrical Characteristics: NATIONAL SEMICONDUCTOR (LOGIC)

Symbol	Parameter	74BCT		54BCT		74BCT		54BCT		Units	Fig. No.
		$T_A = \text{Com}$ $V_{CC} = \text{Com}$ $C_L = 50 \text{ pF}$ 8 Outputs Switching (Note 3)		$T_A = \text{Mil}$ $V_{CC} = \text{Mil}$ $C_L = 50 \text{ pF}$ 8 Outputs Switching (Note 3)		$T_A = \text{Com}$ $V_{CC} = \text{Com}$ $C_L = 250 \text{ pF}$ (Note 4)		$T_A = \text{Mil}$ $V_{CC} = \text{Mil}$ $C_L = 250 \text{ pF}$ (Note 4)			
		Min	Max	Min	Max	Min	Max	Min	Max		
t_{PLH} t_{PHL}	Propagation Delay Data to Output	2.0	8.0			3.0	9.0			ns	◆-3
t_{OSHL} (Note 1)	Pin to Pin Skew HL Data to Output	T-52-30-07					2.0			ns	
t_{OSLH} (Note 1)	Pin to Pin Skew LH Data to Output						1.5			ns	
t_{OST} (Note 1)	Pin to Pin Skew LH/HL Data to Output						6.0			ns	
t_{pv} (Note 2)	Device to Device Skew LH/HL Data to Output						6.0			ns	

Note 1: Skew is defined as the absolute value of the difference between the actual propagation delays for any two separate outputs of the same device. The specification applies to any outputs switching HIGH to LOW (t_{OSHL}), LOW to HIGH (t_{OSLH}), or any combination switching LOW to HIGH and/or HIGH to LOW (t_{OST}).

Note 2: Propagation delay variation for a given set of conditions (i.e., temperature and V_{CC}) from device to device.

Note 3: This specification is guaranteed but not tested. The limits apply to propagation delays for all paths described switching in phase (i.e., all low-to-high, high-to-low, etc.).

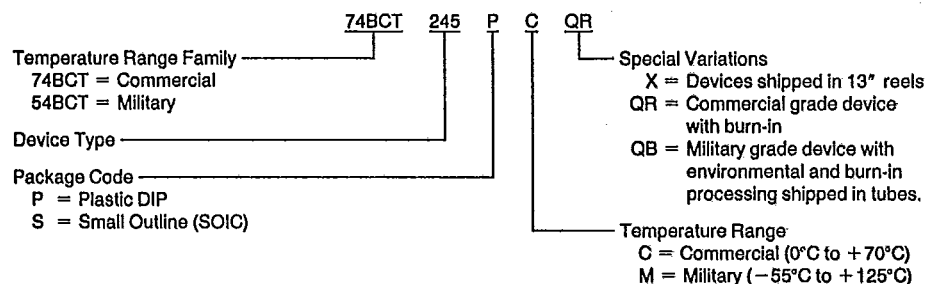
Note 4: This specification is guaranteed but not tested. The limits represent propagation delays with 250 pF load capacitors in place of the 50 pF load capacitors in the standard AC load. This specification pertains to single output switching only.

Capacitance

Symbol	Parameter	Typ	Units	Conditions
C _{IN}	Input Pin Capacitance	11.2	pF	V _{CC} = 5.0V (OE, T/R)
C _{I/O}	Input/Output Pin Capacitance	10.2	pF	V _{CC} = 5.0V (An, Bn)

Ordering Information

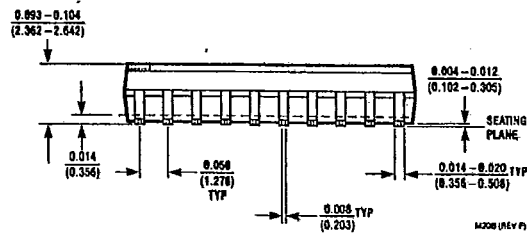
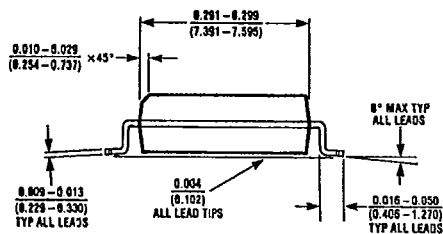
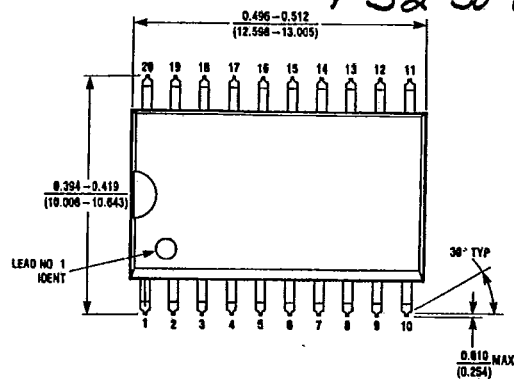
The device number is used to form part of a simplified purchasing code where the package type and temperature range are defined as follows:



Physical Dimensions inches (millimeters)

NATIONAL SEMICONDUCTOR (LOGIC)

T-52-30-07



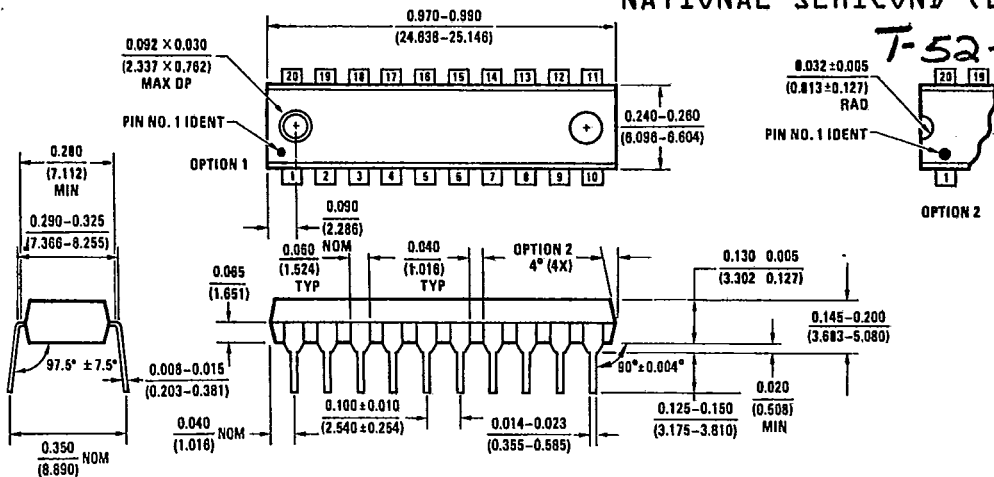
20-Lead Small Outline Integrated Circuit (S)
NS Package Number M20B

Physical Dimensions inches (millimeters) (Continued)

Lit #: 114860

NATIONAL SEMICOND (LOGIC)

T-52-30-07



N20B (REV A)

20-Lead Plastic Dual-In-Line Package (P)
NS Package Number N20B

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2. A critical component is 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.



National Semiconductor
Corporation
2900 Semiconductor Drive
P.O. Box 58090
Santa Clara, CA 95052-8090
Tel: (800) 272-9959
TWX: (910) 339-9240

National Semiconductor
GmbH
Industriestrasse 10
D-8080 Furstenfeldbruck
West Germany
Tel: (0-81-41) 103-0
Telex: 527-849
Fax: (08141) 103554

National Semiconductor
Japan Ltd.
Saiseido Bldg. 5F
4-15 Nishi Shinjuku
Shinjuku-Ku,
Tokyo 160, Japan
Tel: 33-299-7001
FAX: 33-299-7000

National Semiconductor
Hong Kong Ltd.
Suite 513, 5th Floor
Chinachem Golden Plaza,
77 Mody Road, Tsimshatsui East,
Kowloon, Hong Kong
Tel: 3-7231290
Telex: 52996 NSSEA HX
Fax: 3-3112536

National Semicondutores
Do Brasil Ltda.
Av. Brig. Faria Lima, 1383
010 Andor-Cont. 62
01451 Sao Paulo, SP, Brasil
Tel: (55/11) 212-5066
Fax: (55/11) 211-1181 NSBR BR

National Semiconductor
(Australia) Pty, Ltd.
1st Floor, 441 St. Kilda Rd.
Melbourne, 3004
Victoria, Australia
Tel: (61) 267-5000
Fax: 61-3-2677458

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