National Semiconductor

August 1998

54FCT245
Octal Bidirectional Transceiver with TRI-STATE® Outputs

General Description

The 'FCT245 contains eight non-inverting bidirectional buffers with TRI-STATE outputs and is intended for bus-oriented applications. Current sinking capability is 48 mA on 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.

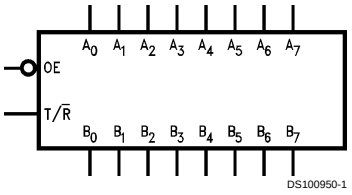
Features

- TTL input and output level compatible
- A and B output sink capability of 48 mA, source capability of 12 mA
- CMOS power consumption
- Standard Microcircuit Drawing (SMD) 5962-8762901

Ordering Code:

Military	Package Number	Package Description
54FCT245DMQB	J20A	20-Lead Ceramic Dual-In-Line
54FCT245FMQB	W20A	20-Lead Cerpak
54FCT245LMQB	E20A	20-Lead Ceramic Leadless Chip Carrier, Type C

Logic Symbol



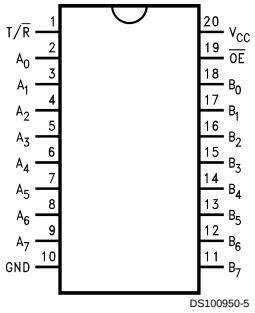
TRI-STATE® is a registered trademark of National Semiconductor Corporation.

© 1998 National Semiconductor Corporation

Downloaded from Elcodis.com electronic components distributor

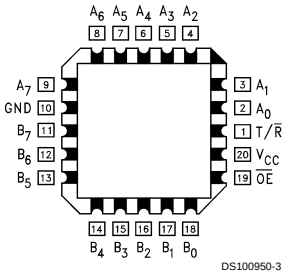
Connection Diagrams

Pin Assignment for DIP and Flatpak.



DS100950-5

Pin Assignment for LCC



DS100950-3

Pin Descriptions

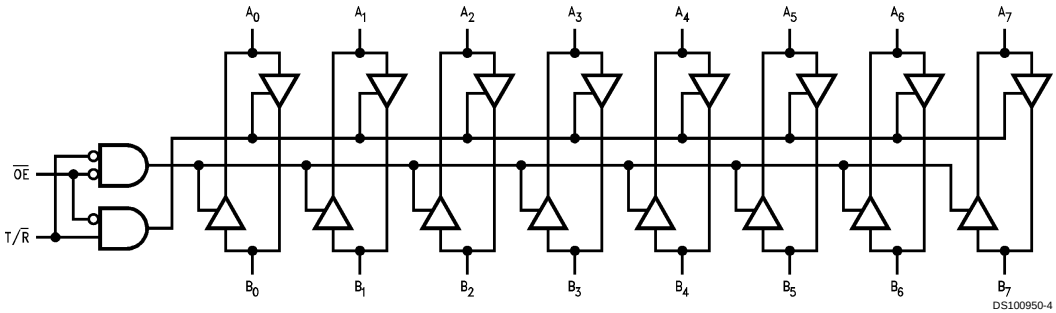
Pin Names	Description
$\overline{OE}$	Output Enable Input (Active LOW)
T/$\overline{R}$	Transmit/Receive Input
A_0–A_7	Side A Inputs or TRI-STATE Outputs
B_0–B_7	Side B Inputs or TRI-STATE Outputs

Truth Table

Inputs		Output
$\overline{OE}$	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

Logic Diagram



DS100950-4

Downloaded from Elcodis.com electronic components distributor

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
V_{CC} Pin Potential to	
Ground Pin	−0.5V to +7.0V
Input Voltage (Note 2)	−0.5V to +7.0V
Input Current (Note 2)	−30 mA to +5.0 mA
Voltage Applied to Any Output	
in the Disabled 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)

Recommended Operating Conditions

Free Air Ambient Temperature	
Military	−55˚C to +125˚C
Supply Voltage	
Military	+4.5V to +5.5V

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.

DC Electrical Characteristics

Symbol	Parameter		FCT245 Min	FCT245 Max	Units	V_{CC}	Conditions
V_{IH}	Input HIGH Voltage		2.0		V		Recognized HIGH Signal
V_{IL}	Input LOW Voltage			0.8	V		Recognized LOW Signal
V_{CD}	Input Clamp Diode Voltage			−1.2	V	Min	I_{IN} = −18 mA ($\overline{OE}$, T/$\overline{R}$)
V_{OH}	Output HIGH Voltage	54FCT	4.3		V	Min	I_{OH} = −300 uA (A_n, B_n)
		54FCT	2.4		V	Min	I_{OH} = −12 mA (A_n, B_n)
V_{OL}	Output LOW Voltage	54FCT		0.2	V	Min	I_{OL} = 300 uA (A_n, B_n)
		54FCT		0.55	V	Min	I_{OL} = 48 mA (A_n, B_n)
I_{IH}	Input HIGH Current			5 5	µA	Max	V_{IN} = 2.7V ($\overline{OE}$, T/$\overline{R}$) V_{IN} = V_{CC} ($\overline{OE}$, T/$\overline{R}$)
I_{BVIT}	Input HIGH Current Breakdown Test (I/O)			20	µA	Max	V_{IN} = 5.5V (A_n, B_n)
I_{IL}	Input LOW Current			−5	µA	Max	V_{IN} = 0.0V ($\overline{OE}$, T/$\overline{R}$)
I_{OS}	Output Short-Circuit Current			−60	mA	Max	V_{OUT} = 0.0V (A_n, B_n)
I_{CCQ}	Power Supply Current			1.5	mA	Max	V_{IN} = 0.2V or V_{IN} = 5.3V, V_{CC} = 5.5V
ΔI_{CC}	Power Supply Current			2.0	mA	Max	V_{CC} = 5.5V, V_{IN} = 3.4V
I_{CCT}	Total Power Supply Current			6.0	mA		V_{IN} = 3.4V or V_{IN} = GND, $\overline{OE}$ = T/$\overline{R}$ = GND, V_{CC} = 5.5V, f_i = 10Mhz, outputs open, one bit toggling - 50% duty cycle
				5.5	mA	Max	V_{IN} = 5.3V or V_{IN} = 0.2V,$\overline{OE}$ = T/$\overline{R}$ = GND, V_{CC} = 5.5V, f_i = 10Mhz, outputs open, one bit toggling - 50% duty cycle
I_{CCD}	Dynamic I_{CC} (Note 3)			0.4	mA/ MHz	Max	Outputs Open, $\overline{OE}$ =GND, T/$\overline{R}$ = GND or V_{CC} One Bit Toggling, 50% Duty Cycle

Note 3: Guaranteed but not tested.

Downloaded from Elcodis.com electronic components distributor

AC Electrical Characteristics

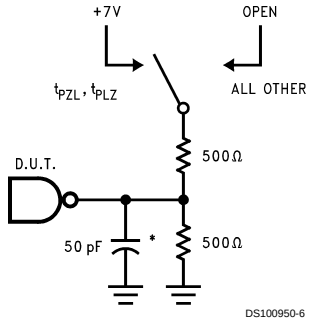
Symbol	Parameter	54FCT $T_A = -55^\circ C$ to $+125^\circ C$, $V_{CC} = 4.5V-5.5V$, $C_L = 50$ pF		Units	Fig. No.
		Min	Max		
t_{PLH}	Propagation Delay	1.5	7.5	ns	*Figure 4*
t_{PHL}	Data to Outputs	1.5	7.5		
t_{PZH}	Output Enable	1.5	10.0	ns	*Figure 5*
t_{PZL}	Time	1.5	10.0		
t_{PHZ}	Output Disable	1.5	10.0	ns	*Figure 5*
t_{PLZ}	Time	1.5	10.0		

Capacitance

Symbol	Parameter	Max	Units	Conditions $T_A = 25^\circ C$
C_{IN}	Input Capacitance	10.0	pF	V_{CC} = 0V ($\overline{OE}$, T/$\overline{R}$)
$C_{I/O}$ (Note 4)	I/O Capacitance	12.0	pF	V_{CC} = 5.0V (A_n, B_n)

Note 4: $C_{I/O}$ is measured at frequency f = 1 MHz, per MIL-STD-883B, Method 3012.

AC Loading



*Includes jig and probe capacitance

FIGURE 1. Standard AC Test Load

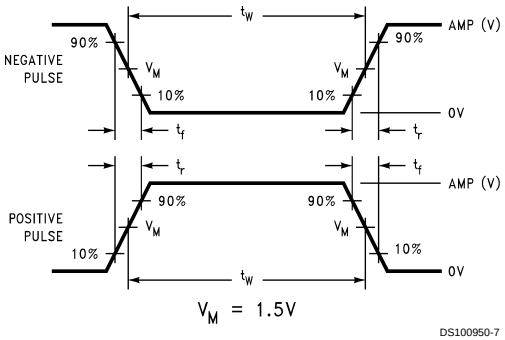


FIGURE 2. Test Input Signal Levels

Amplitude	Rep. Rate	t_w	t_r	t_f
3.0V	1 MHz	500 ns	2.5 ns	2.5 ns

FIGURE 3. Test Input Signal Requirements

Downloaded from Elcodis.com electronic components distributor

AC Waveforms

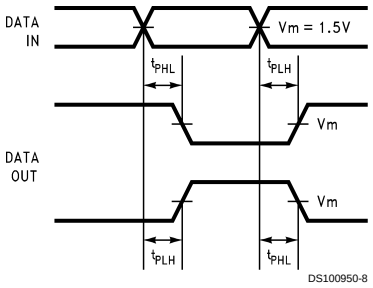


FIGURE 4. Propagation Delay Waveforms for Inverting and Non-Inverting Functions

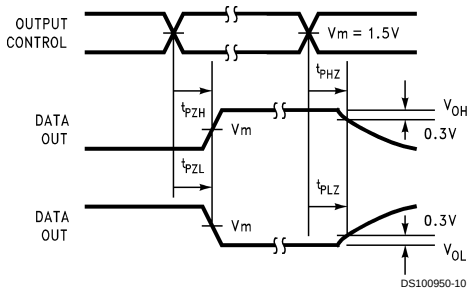
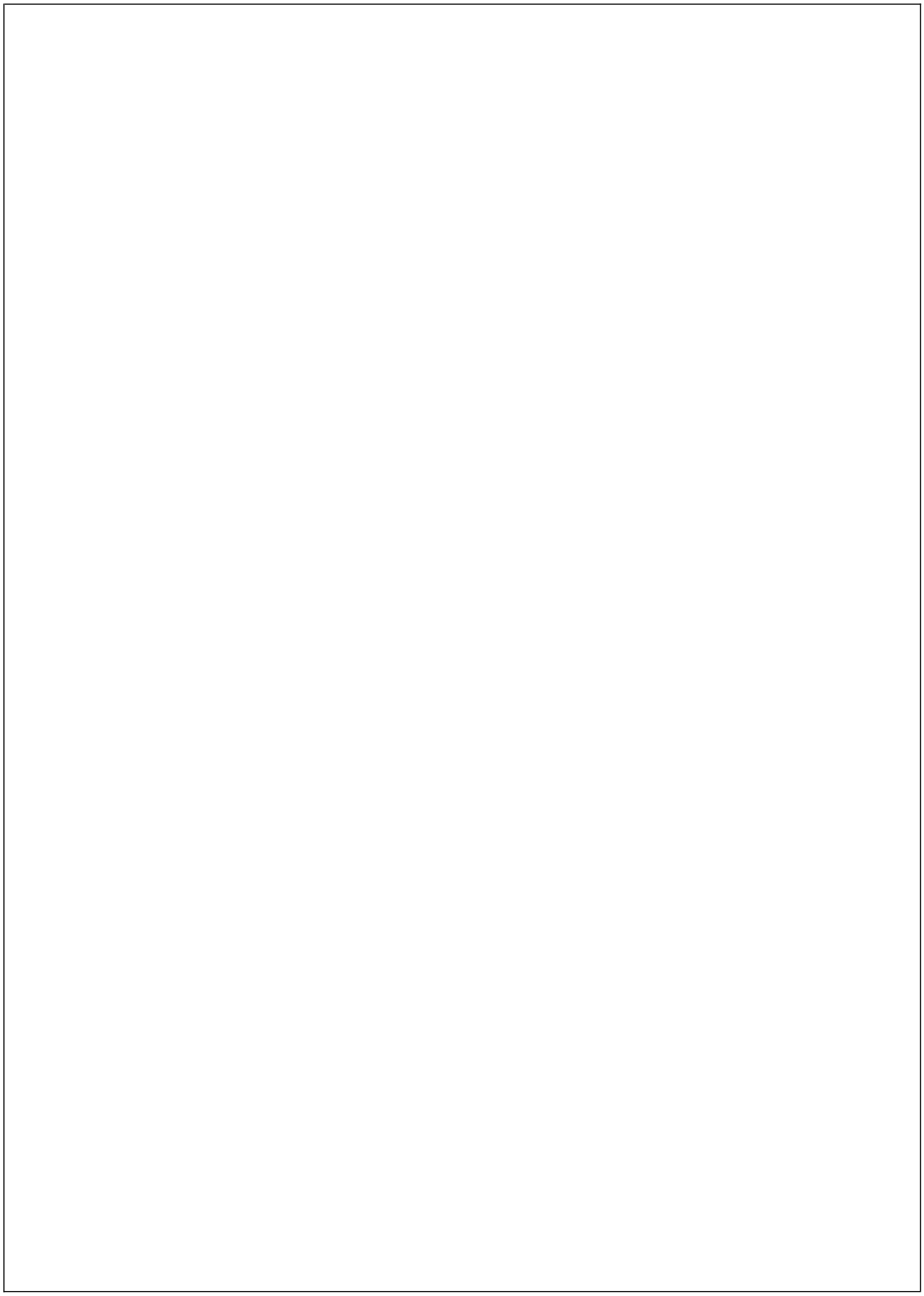


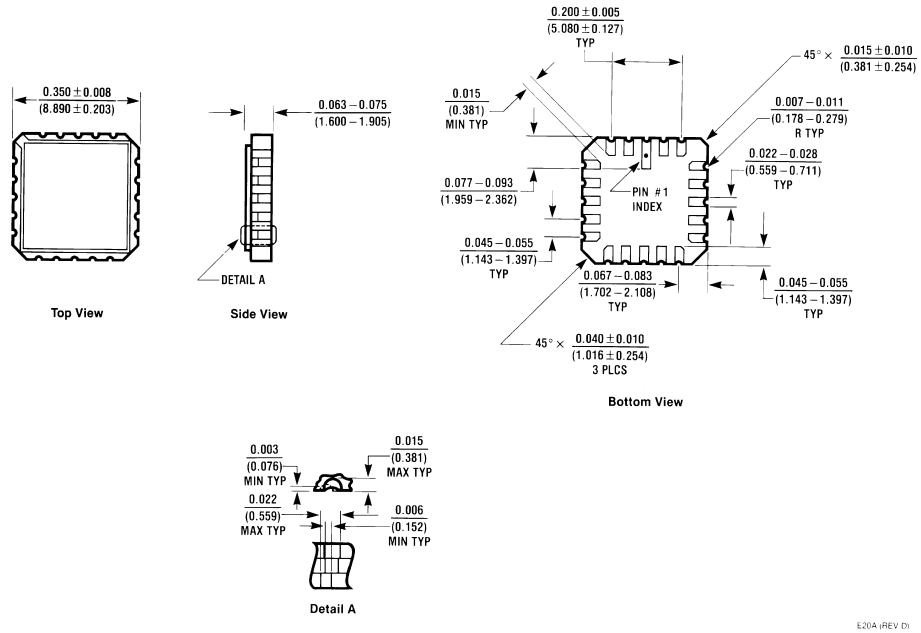
FIGURE 5. TRI-STATE Output HIGH and LOW Enable and Disable Times

Downloaded from Elcodis.com electronic components distributor

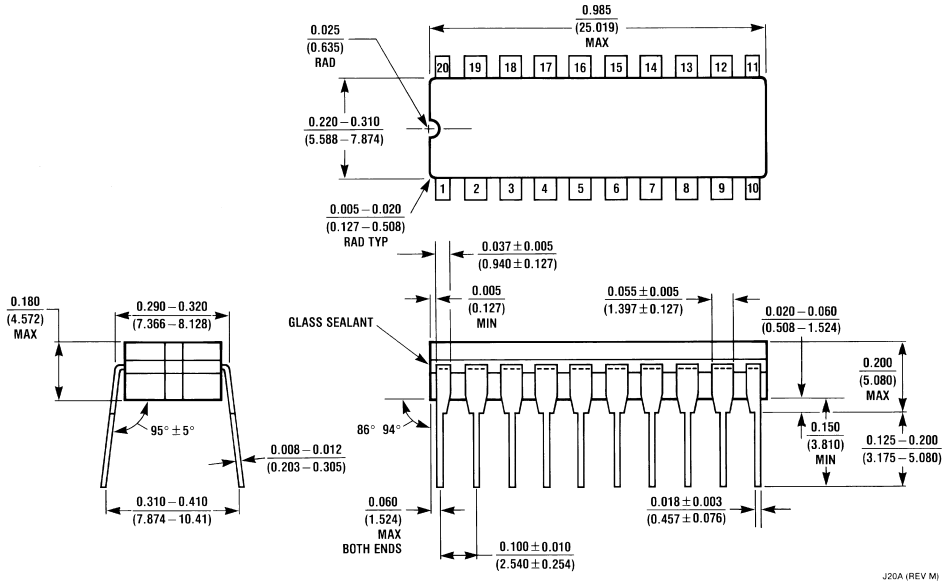


Downloaded from Elcodis.com electronic components distributor

Physical Dimensions inches (millimeters) unless otherwise noted



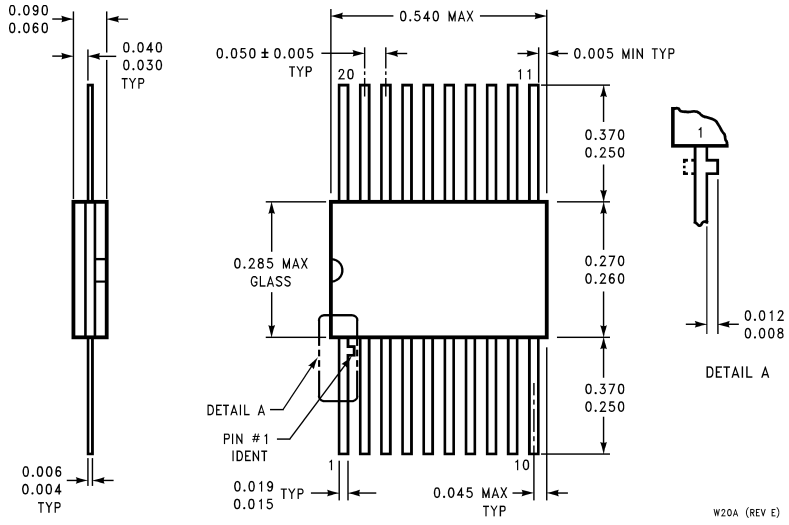
20-Terminal Ceramic Chip Carrier (L)
NS Package Number E20A



20-Lead Ceramic Dual-In-Line Package (D)
NS Package Number J20A

Downloaded from Elcodis.com electronic components distributor

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



20-Lead Ceramic Flatpak (F)
NS Package Number W20A

LIFE SUPPORT POLICY

NATIONAL'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF THE PRESIDENT OF NATIONAL SEMICONDUCTOR CORPORATION. As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, and whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury to the user.
2. A critical component in 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
Americas
Tel: 1-800-272-9959
Fax: 1-800-737-7018
Email: support@nsc.com

www.national.com

National Semiconductor Europe
Fax: +49 (0) 1 80-530 85 86
Email: europe.support@nsc.com
Deutsch Tel: +49 (0) 1 80-530 85 85
English Tel: +49 (0) 1 80-532 78 32
Français Tel: +49 (0) 1 80-532 93 58
Italiano Tel: +49 (0) 1 80-534 16 80

National Semiconductor Asia Pacific Customer Response Group
Tel: 65-2544466
Fax: 65-2504466
Email: sea.support@nsc.com

National Semiconductor Japan Ltd.
Tel: 81-3-5620-6175
Fax: 81-3-5620-6179

National does not assume any responsibility for use of any circuitry described, no circuit patent licenses are implied and National reserves the right at any time without notice to change said circuitry and specifications.

Downloaded from Elcodis.com electronic components distributor