

## 54FCT245

### Octal Bidirectional Transceiver with TRI-STATE® Outputs

#### General Description

The 54FCT245 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 ( $T/\bar{R}$ ) 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 input, when HIGH, disables both A and B ports by placing them in a High Z condition.

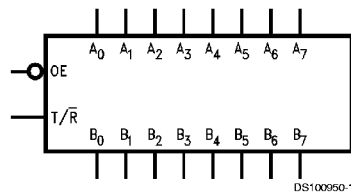
#### Features

- 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:

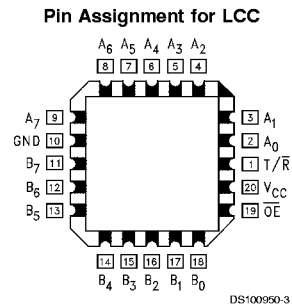
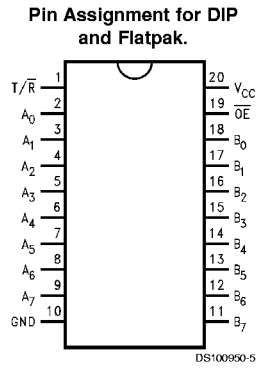
Military	Package Number	Package Description
54FCT245DMQB	J20A	20-Lead Ceramic Dual-In-Line
54FCT245FMQB	W20A	20-Lead Cerpak
54FCT245LMQB	E20A	20-Lead Ceramic Leadless Chip Carrier, Type C

#### Logic Symbol



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

## Connection Diagrams



## Pin Descriptions

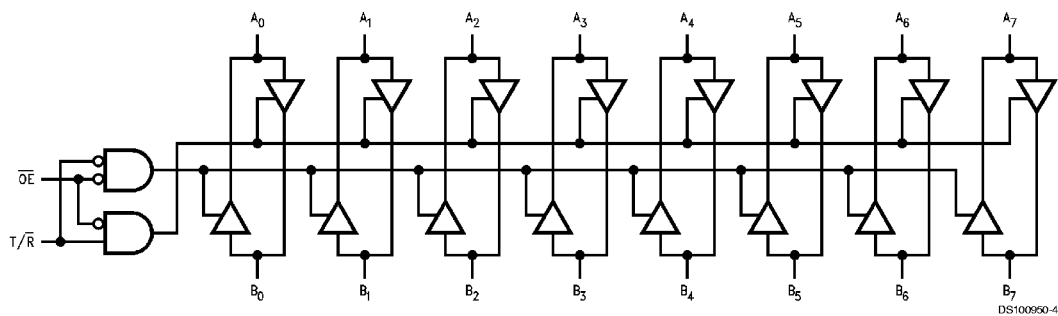
Pin Names	Description
$\overline{OE}$	Output Enable Input (Active LOW)
T/R	Transmit/Receive Input
A <sub>0</sub> -A <sub>7</sub>	Side A Inputs or TRI-STATE Outputs
B <sub>0</sub> -B <sub>7</sub>	Side B Inputs or TRI-STATE Outputs

## Truth Table

Inputs		Output
$\overline{OE}$	T/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



## 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 <sub>CC</sub> 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<sub>CC</sub>  
 Current Applied to Output  
 in LOW State (Max) twice the rated I<sub>OL</sub> (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		Units	V <sub>CC</sub>	Conditions
		Min	Max			
V <sub>IH</sub>	Input HIGH Voltage	2.0		V		Recognized HIGH Signal
V <sub>IL</sub>	Input LOW Voltage		0.8	V		Recognized LOW Signal
V <sub>CD</sub>	Input Clamp Diode Voltage		-1.2	V	Min	I <sub>IN</sub> = -18 mA ( $\overline{OE}$ , T/ $\overline{R}$ )
V <sub>OH</sub>	Output HIGH Voltage	54FCT	4.3	V	Min	I <sub>OH</sub> = -300 $\mu$ A (A <sub>n</sub> , B <sub>n</sub> )
		54FCT	2.4	V	Min	I <sub>OH</sub> = -12 mA (A <sub>n</sub> , B <sub>n</sub> )
V <sub>OL</sub>	Output LOW Voltage	54FCT	0.2	V	Min	I <sub>OL</sub> = 300 $\mu$ A (A <sub>n</sub> , B <sub>n</sub> )
		54FCT	0.55	V	Min	I <sub>OL</sub> = 48 mA (A <sub>n</sub> , B <sub>n</sub> )
I <sub>IH</sub>	Input HIGH Current		5	$\mu$ A	Max	V <sub>IN</sub> = 2.7V ( $\overline{OE}$ , T/ $\overline{R}$ )
			5	$\mu$ A	Max	V <sub>IN</sub> = V <sub>CC</sub> ( $\overline{OE}$ , T/ $\overline{R}$ )
I <sub>BVIT</sub>	Input HIGH Current Breakdown Test (I/O)		20	$\mu$ A	Max	V <sub>IN</sub> = 5.5V (A <sub>n</sub> , B <sub>n</sub> )
I <sub>IL</sub>	Input LOW Current		-5	$\mu$ A	Max	V <sub>IN</sub> = 0.0V ( $\overline{OE}$ , T/ $\overline{R}$ )
I <sub>OS</sub>	Output Short-Circuit Current		-60	mA	Max	V <sub>OUT</sub> = 0.0V (A <sub>n</sub> , B <sub>n</sub> )
I <sub>CCQ</sub>	Power Supply Current		1.5	mA	Max	V <sub>IN</sub> = 0.2V or V <sub>IN</sub> = 5.3V, V <sub>CC</sub> = 5.5V
$\Delta$ I <sub>CC</sub>	Power Supply Current		2.0	mA	Max	V <sub>CC</sub> = 5.5V, V <sub>IN</sub> = 3.4V
I <sub>CCT</sub>	Total Power Supply Current		6.0	mA		V <sub>IN</sub> = 3.4V or V <sub>IN</sub> = GND, $\overline{OE}$ = T/ $\overline{R}$ = GND, V <sub>CC</sub> = 5.5V, f <sub>i</sub> = 10Mhz, outputs open, one bit toggling - 50% duty cycle
			5.5	mA	Max	V <sub>IN</sub> = 5.3V or V <sub>IN</sub> = 0.2V, $\overline{OE}$ = T/ $\overline{R}$ = GND, V <sub>CC</sub> = 5.5V, f <sub>i</sub> = 10Mhz, outputs open, one bit toggling - 50% duty cycle
I <sub>CCD</sub>	Dynamic I <sub>CC</sub> (Note 3)		0.4	mA/ MHz	Max	Outputs Open, $\overline{OE}$ = GND, T/ $\overline{R}$ = GND or V <sub>CC</sub> One Bit Toggling, 50% Duty Cycle

**Note 3:** Guaranteed but not tested.

## AC Electrical Characteristics

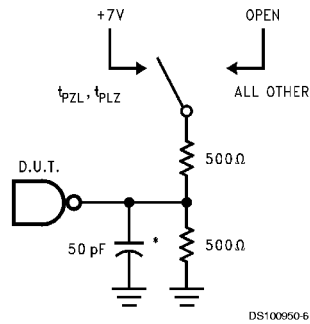
Symbol	Parameter	54FCT		Units	Fig. No.
		$T_A = -55^\circ\text{C to } +125^\circ\text{C}$ $V_{CC} = 4.5\text{V} - 5.5\text{V}$ $C_L = 50\text{ pF}$			
		Min	Max		
$t_{PLH}$	Propagation Delay	1.5	7.5	ns	Figure 4
$t_{PHL}$	Data to Outputs	1.5	7.5		
$t_{PZH}$	Output Enable	1.5	10.0	ns	Figure 5
$t_{PZL}$	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 $T_A = 25^\circ\text{C}$
$C_{IN}$	Input Capacitance	10.0	pF	$V_{CC} = 0\text{V}$ ( $\overline{OE}$ , $T/\overline{R}$ )
$C_{I/O}$ (Note 4)	I/O Capacitance	12.0	pF	$V_{CC} = 5.0\text{V}$ ( $A_n$ , $B_n$ )

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

## AC Loading



\*Includes jig and probe capacitance

FIGURE 1. Standard AC Test Load

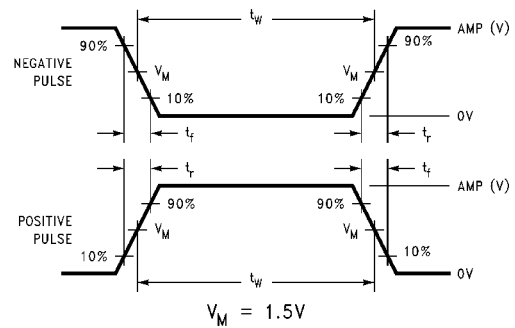
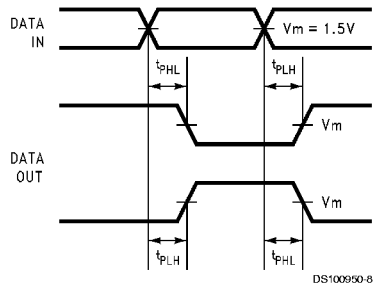


FIGURE 2. Test Input Signal Levels

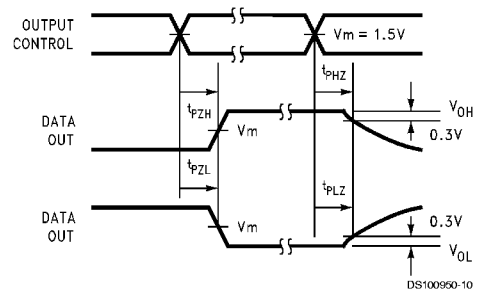
Amplitude	Rep. Rate	$t_w$	$t_r$	$t_f$
3.0V	1 MHz	500 ns	2.5 ns	2.5 ns

FIGURE 3. Test Input Signal Requirements

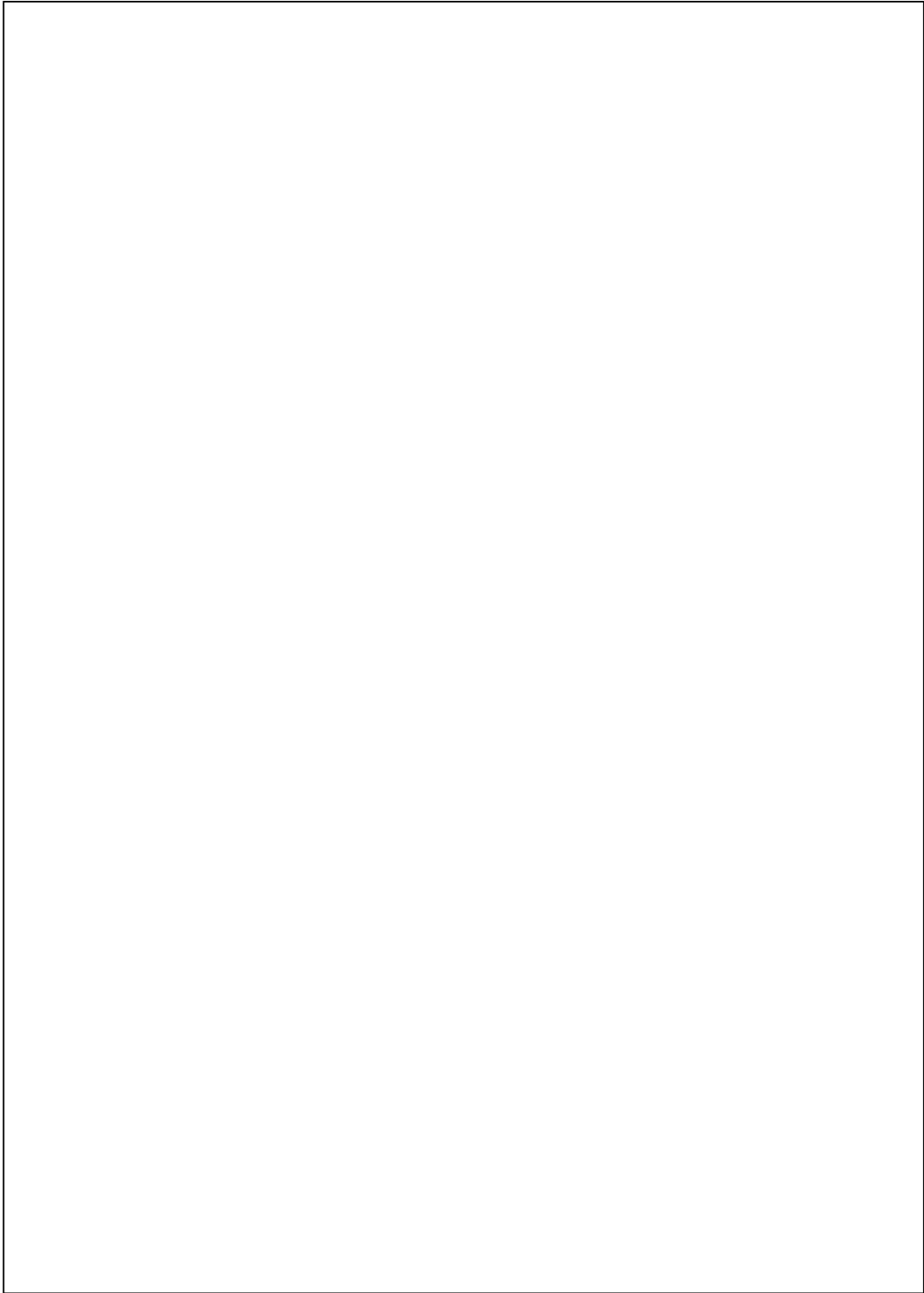
## AC Waveforms



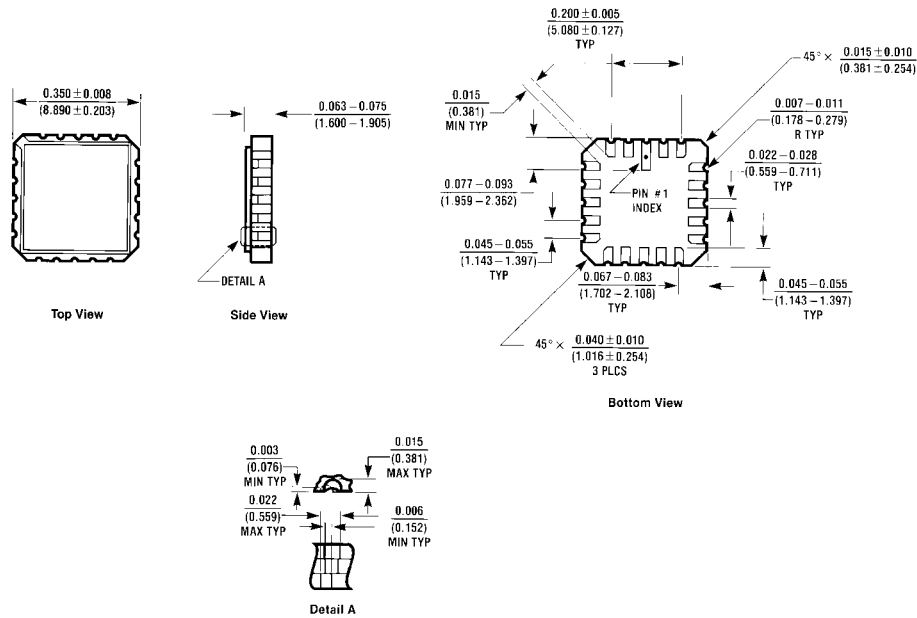
**FIGURE 4. Propagation Delay Waveforms for Inverting and Non-Inverting Functions**



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

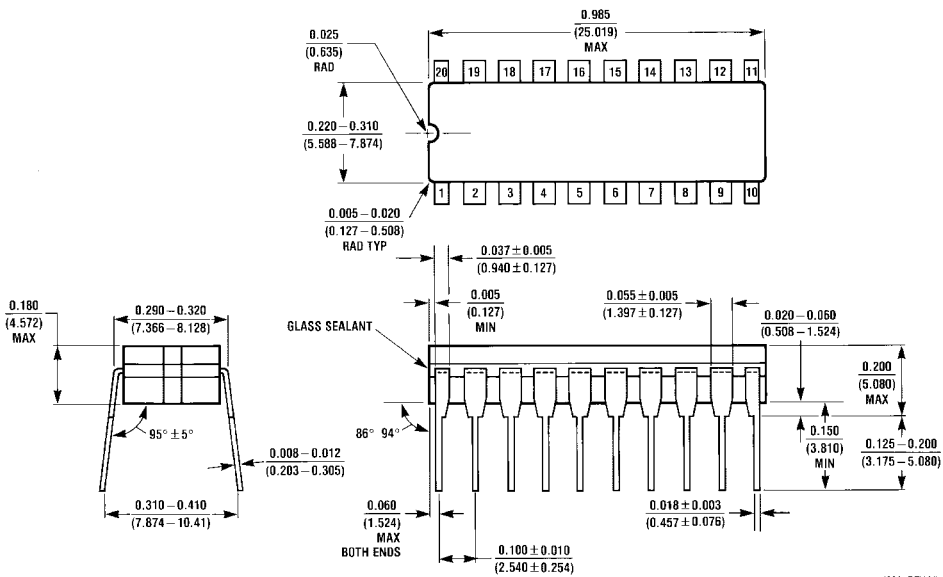


**Physical Dimensions** inches (millimeters) unless otherwise noted



L20A (REV D)

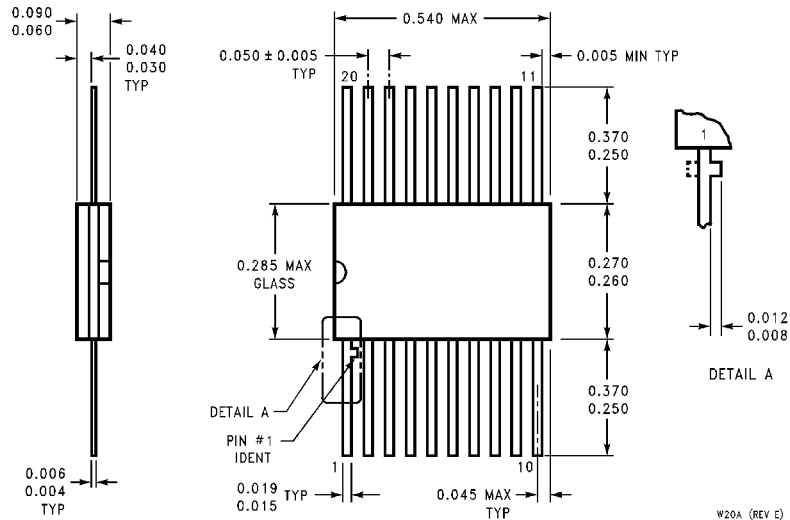
**20-Terminal Ceramic Chip Carrier (L)**  
**NS Package Number E20A**



J20A (REV M)

**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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