



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/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.

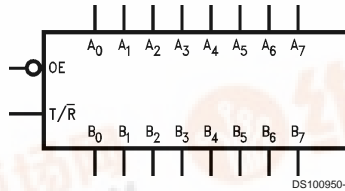
Features

- 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

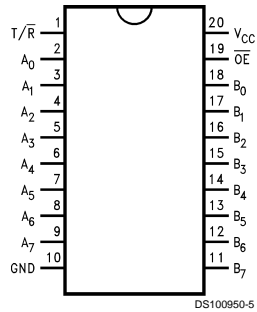


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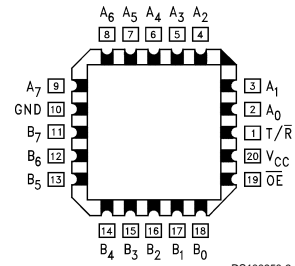
Connection Diagrams

Pin Assignment for DIP and Flatpak.



DS100950-5

Pin Assignment for LCC



DS100950-3

Pin Descriptions

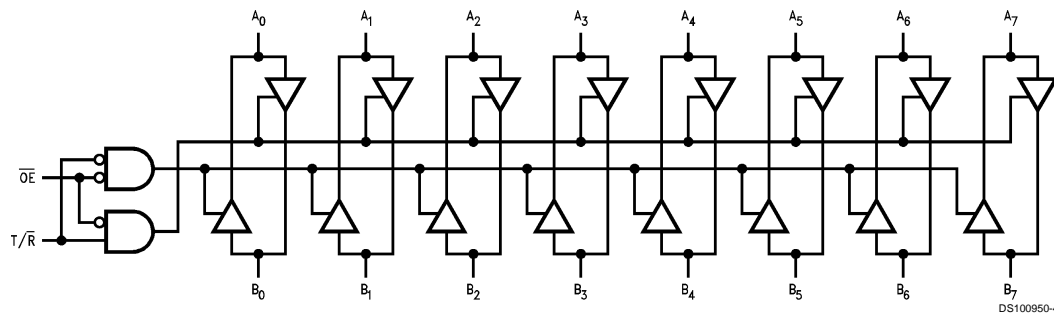
| Pin Names | Description |
|------------------|------------------------------------|
| \overline{OE} | Output Enable Input (Active LOW) |
| T/\overline{R} | Transmit/Receive Input |
| A_0 – A_7 | Side A Inputs or TRI-STATE Outputs |
| B_0 – B_7 | Side B Inputs or TRI-STATE Outputs |

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

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 | | Units | V _{CC} | Conditions |
|-------------------|---|--------|------|--------|-----------------|---|
| | | Min | Max | | | |
| 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 (OE, T/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 | μA | Max | V _{IN} = 2.7V (OE, T/R) |
| | | | 5 | μA | Max | V _{IN} = V _{CC} (OE, T/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 (OE, T/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, OE = T/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, OE = T/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, OE = GND, T/R = GND or V _{CC} One Bit Toggling, 50% Duty Cycle |

Note 3: Guaranteed but not tested.

AC Electrical Characteristics

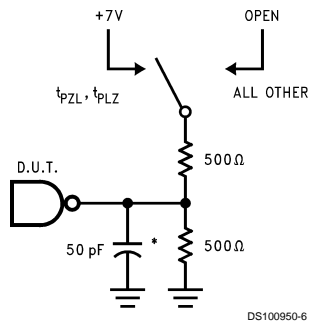
| Symbol | Parameter | 54FCT | | Units | Fig. No. |
|-----------|-------------------|--|------|-------|----------|
| | | $T_A = -55^\circ\text{C to } +125^\circ\text{C}$ $V_{CC} = 4.5\text{V} - 5.5\text{V}$ $C_L = 50\text{ pF}$ | | | |
| | | Min | Max | | |
| t_{PLH} | Propagation Delay | 1.5 | 7.5 | 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 |
|--------------------|-------------------|------|-------|--|
| C_{IN} | Input Capacitance | 10.0 | pF | $T_A = 25^\circ\text{C}$ $V_{CC} = 0\text{V (OE, T/R)}$ |
| $C_{I/O}$ (Note 4) | I/O Capacitance | 12.0 | pF | $V_{CC} = 5.0\text{V (A}_n, \text{B}_n)$ |

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

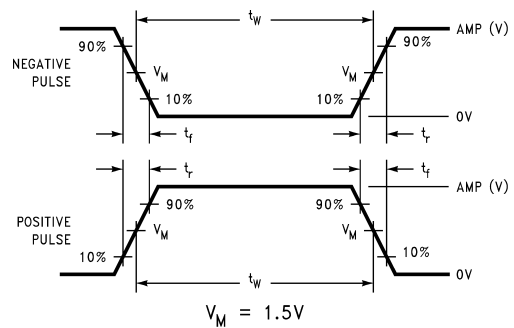


FIGURE 2. Test Input Signal Levels

| 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

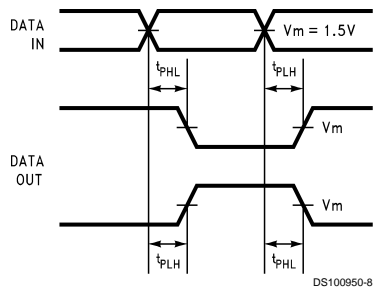


FIGURE 4. Propagation Delay Waveforms for Inverting and Non-Inverting Functions

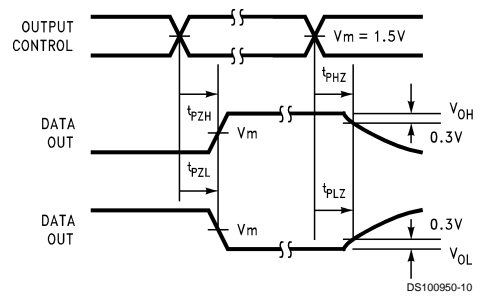
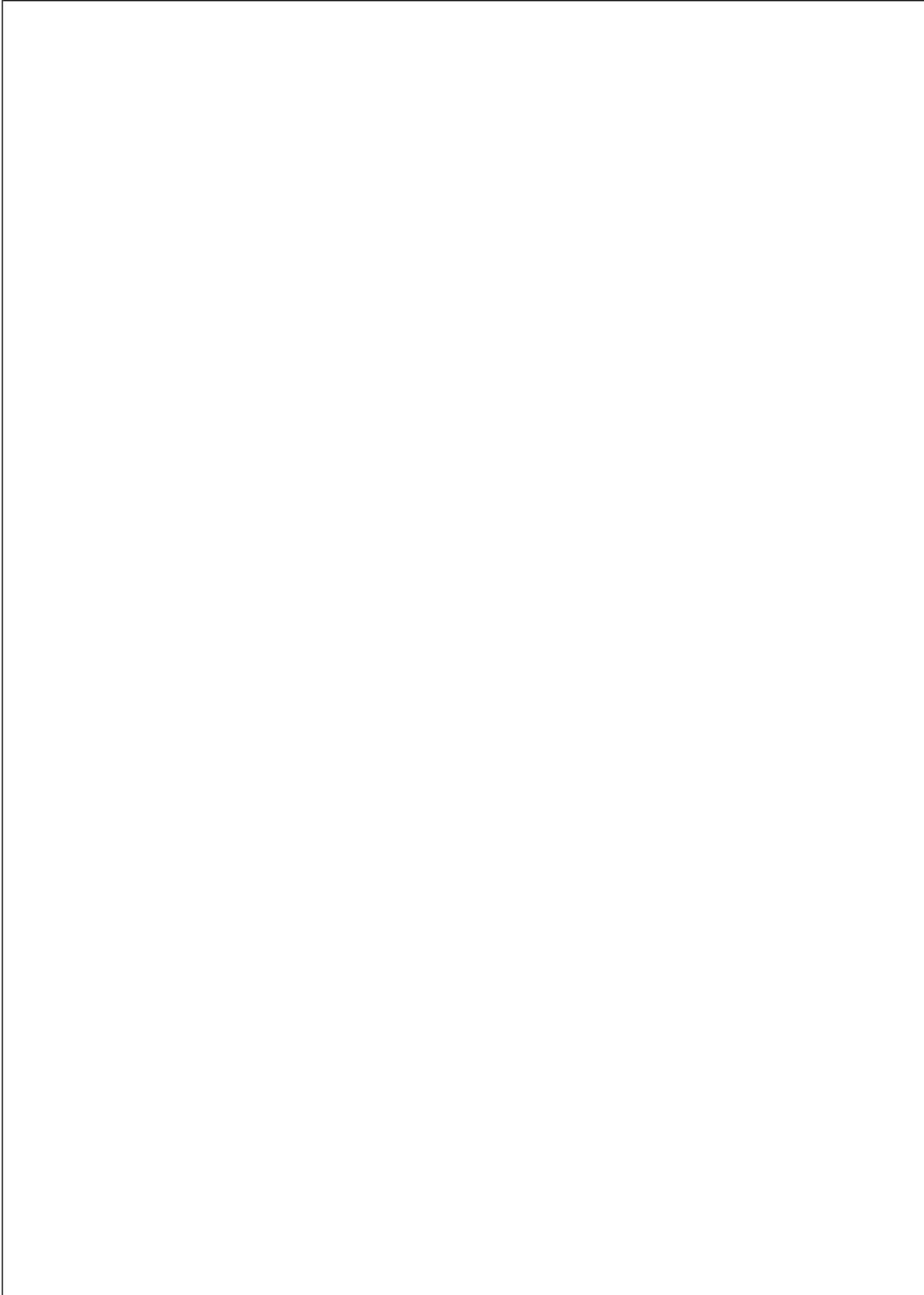
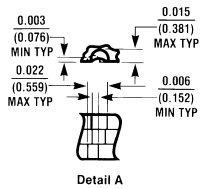
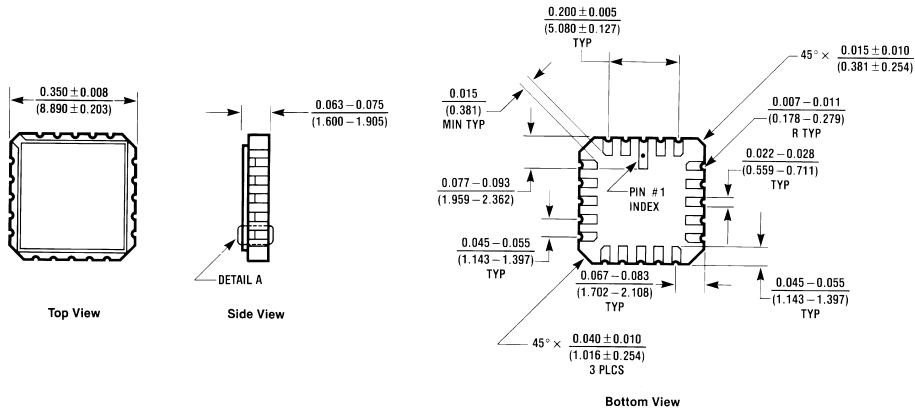


FIGURE 5. TRI-STATE Output HIGH and LOW Enable and Disable Times

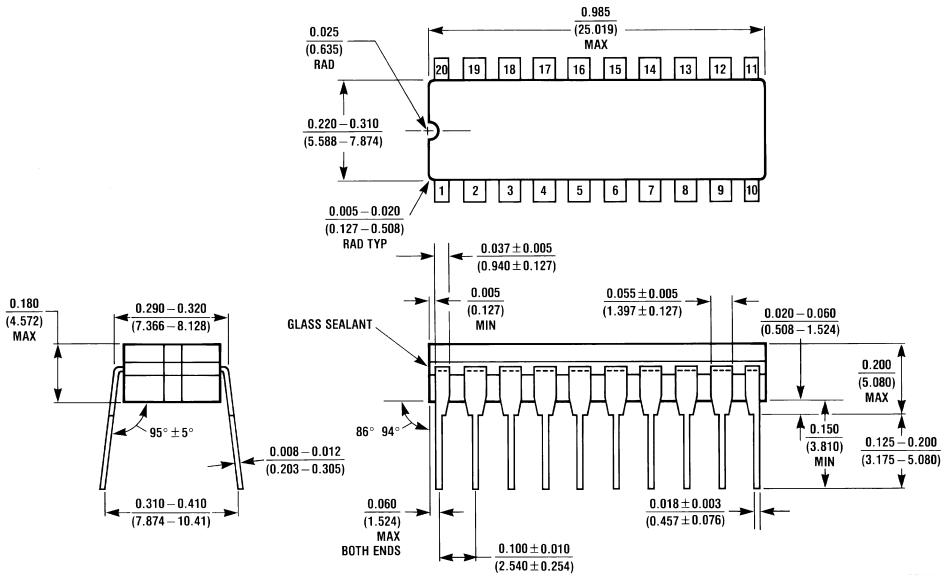


Physical Dimensions inches (millimeters) unless otherwise noted



E20A (REV D)

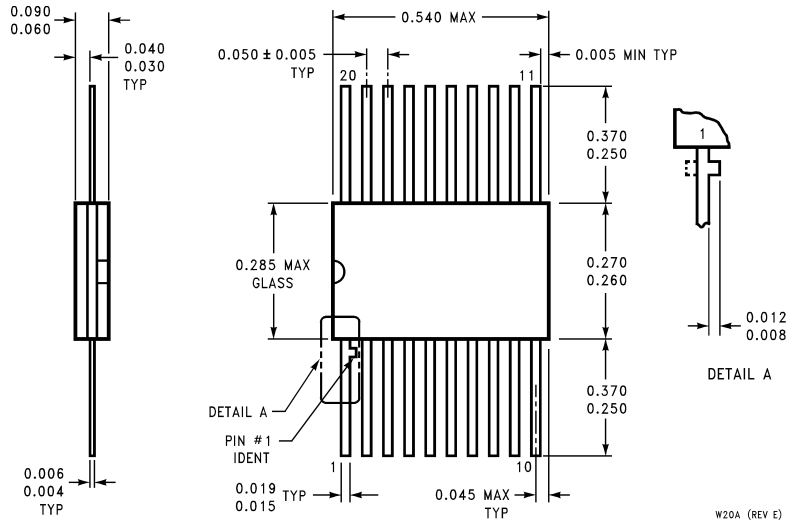
20-Terminal Ceramic Chip Carrier (L)
NS Package Number E20A



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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