

54FCT573

54FCT573 Octal D-Type Latch with -TRISTATE Outputs



Literature Number: SNOS422

54FCT573

Octal D-Type Latch with TRI-STATE® Outputs

General Description

The 'FCT573 is an octal latch with buffered common Latch Enable (LE) and buffered common Output Enable (\overline{OE}) inputs.

This device is functionally identical to the 'FCT373 but has different pinouts.

Features

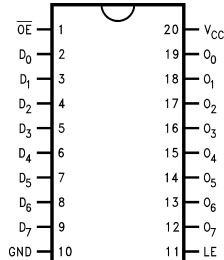
- Inputs and outputs on opposite sides of package allow easy interface with microprocessors
- Useful as input or output port for microprocessors
- TTL input and output level compatible
- CMOS power consumption
- Functionally identical to 'FCT373
- TRI-STATE outputs for bus interfacing
- Output sink capability of 32 mA, source capability of 12 mA
- Standard Microcircuit Drawing (SMD) 5962-8863901

Ordering Code

| Military | Package Number | Package Description |
|--------------|----------------|---|
| 54FCT573DMQB | J20A | 20-Lead Ceramic Dual-In-Line |
| 54FCT573FMQB | W20A | 20-Lead Cerpack |
| 54FCT573LMQB | E20A | 20-Lead Ceramic Leadless Chip Carrier, Type C |

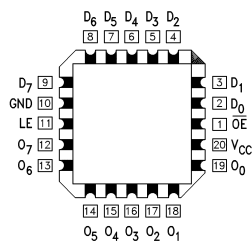
Connection Diagram

Pin Assignment
for DIP and Cerpack



DS100951-1

Pin Assignment
for LCC



DS100951-39

| Pin Names | Description |
|--------------------------------|--|
| D ₀ -D ₇ | Data Inputs |
| LE | Latch Enable Input (Active HIGH) |
| \overline{OE} | TRI-STATE Output Enable Input (Active LOW) |
| O ₀ -O ₇ | TRI-STATE Latch Outputs |

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Functional Description

The 'FCT573 contains eight D-type latches with TRI-STATE output buffers. When the Latch Enable (LE) input is HIGH, data on the D_n inputs enters the latches. In this condition the latches are transparent, i.e., a latch output will change state each time its D input changes. When LE is LOW the latches store the information that was present on the D inputs a setup time preceding the HIGH-to-LOW transition of LE. The TRI-STATE buffers are controlled by the Output Enable (\overline{OE}) input. When \overline{OE} is LOW, the buffers are in the bi-state mode. When \overline{OE} is HIGH the buffers are in the high impedance mode but this does not interfere with entering new data into the latches.

Function Table

| Inputs | | | Outputs |
|-----------------|----|---|---------|
| \overline{OE} | LE | D | O |
| L | H | H | H |
| L | H | L | L |
| L | L | X | O_0 |
| H | X | X | Z |

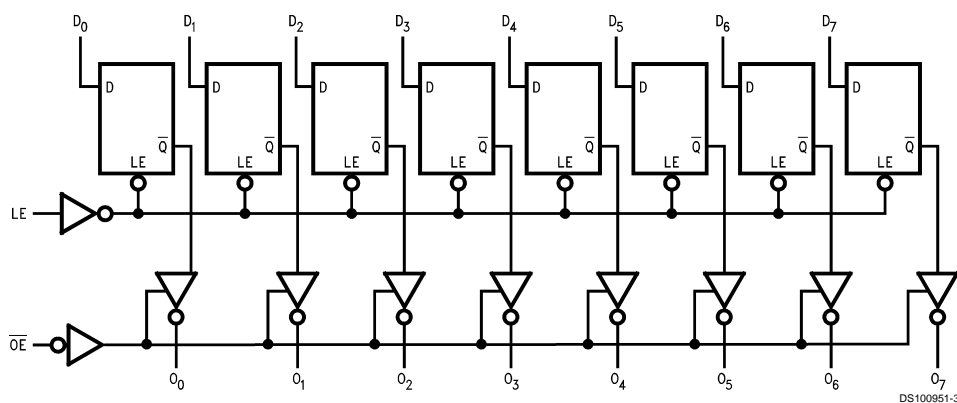
H = HIGH Voltage Level

L = LOW Voltage Level

X = Immaterial

O_0 = Value stored from previous clock cycle

Logic Diagram



Please note that this diagram is provided only for the understanding of logic operations and should not be used to estimate propagation delays.

DS100951-3

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)
DC Latchup Source Current -500 mA

Recommended Operating Conditions

| | |
|------------------------------|-----------------|
| Free Air Ambient Temperature | |
| Military | -55°C to +125°C |
| Supply Voltage | |
| Military | +4.5V to +5.5V |
| Minimum Input Edge Rate | (ΔV/Δt) |
| Data Input | 50 mV/ns |
| Enable Input | 20 mV/ns |

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 | FCT573 | | | Units | V _{CC} | Conditions |
|------------------|--------------------------------|--------|-----|------|--------|-----------------|---|
| | | Min | Typ | 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 |
| V _{OH} | Output HIGH Voltage | 54FCT | 4.3 | | V | Min | I _{OH} = -300 μA |
| | | 54FCT | 2.4 | | | | I _{OH} = -12 mA |
| V _{OL} | Output LOW Voltage | 54FCT | | 0.2 | V | Min | I _{OL} = 300 μA |
| | | 54FCT | | 0.5 | | | I _{OL} = 32 mA |
| I _{IH} | Input HIGH Current | | 5 | | μA | Max | V _{IN} = V _{CC} |
| I _{IL} | Input LOW Current | | -5 | | μA | Max | V _{IN} = 0.0V |
| I _{OZH} | Output Leakage Current | | 50 | | μA | 0 – 5.5V | V _{OUT} = 2.7V; \overline{OE} = 2.0V |
| I _{OZL} | Output Leakage Current | | -50 | | μA | 0 – 5.5V | V _{OUT} = 0.5V; \overline{OE} = 2.0V |
| I _{OS} | Output Short-Circuit Current | | -60 | | mA | Max | V _{OUT} = 0.0V |
| I _{CCQ} | Quiescent Power Supply Current | | 1.5 | | mA | Max | V _{IN} < 0.2V or V _{IN} 5.3V, V _{CC} = 5.5V |
| ΔI _{CC} | Quiescent Power Supply Current | | 2.0 | | mA | Max | V _I = 3.4V, V _{CC} = 5.5V |
| I _{CCD} | Dynamic I _{CC} | | 0.4 | | mA/MHz | Max | Outputs Open, V _{CC} = 5.5V, V _{IN} 5.3V or V _{IN} < 0.2V, One Bit Toggling, 50% Duty Cycle, \overline{OE} = GND, LE = V _{CC} |
| I _{CC} | Total Power Supply Current | | 6.0 | | mA | Max | Outputs Open, f _{CP} = 10 MHz, V _{CC} = 5.5V, V _{IN} 5.3V or V _{IN} < 0.2V, One Bit Toggling, 50% Duty Cycle, \overline{OE} = GND, LE = V _{CC} |

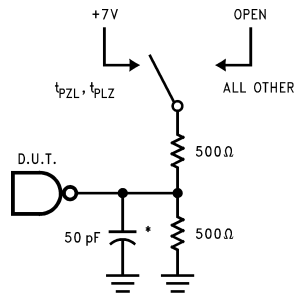
| AC Electrical Characteristics | | | | | |
|-------------------------------|----------------------------------|--|------|-------|----------|
| Symbol | Parameter | 54FCT | | Units | Fig. No. |
| | | T _A = -55°C to +125°C V _{CC} = 4.5V to 5.5V C _L = 50 pF | | | |
| | | Min | Max | | |
| t _{PLH} | Propagation Delay | 1.0 | 8.5 | ns | Figure 4 |
| t _{PHL} | D _n to O _n | 1.0 | 8.5 | | |
| t _{PLH} | Propagation Delay | 1.0 | 15.0 | ns | Figure 4 |
| t _{PHL} | LE to O _n | 1.0 | 15.0 | | |
| t _{PZH} | Output Enable Time | 1.0 | 13.5 | ns | Figure 6 |
| t _{PZL} | | 1.0 | 13.5 | | |
| t _{PHZ} | Output Disable Time | 1.0 | 10.0 | ns | Figure 6 |
| t _{PLZ} | Time | 1.0 | 10.0 | | |

| AC Operating Requirements | | | | | |
|---------------------------|-----------------------------|--|-----|-------|----------|
| Symbol | Parameter | 54FCT | | Units | Fig. No. |
| | | T _A = -55°C to +125°C V _{CC} = 4.5V to 5.5V C _L = 50 pF | | | |
| | | Min | Max | | |
| t _s (H) | Set Time, HIGH | 2.0 | | ns | Figure 7 |
| t _s (L) | or LOW D _n to LE | 2.0 | | | |
| t _h (H) | Hold Time, HIGH | 1.5 | | ns | Figure 7 |
| t _h (L) | or LOW D _n to LE | 1.5 | | | |
| t _w (H) | Pulse Width, LE HIGH | 6.0 | | ns | Figure 5 |

| Capacitance | | | | | |
|---------------------------|--------------------|-----|-------|---------------------------------------|--|
| Symbol | Parameter | Max | Units | Conditions (T _A = 25°C) | |
| C _{IN} | Input Capacitance | 10 | pF | V _{CC} = 0V | |
| C _{OUT} (Note 3) | Output Capacitance | 12 | pF | V _{CC} = 5.0V | |

Note 3: C_{OUT} is measured at frequency f = 1 MHz per MIL-STD-883B, Method 3012.

AC Loading



*Includes jig and probe capacitance

FIGURE 1. Test Load

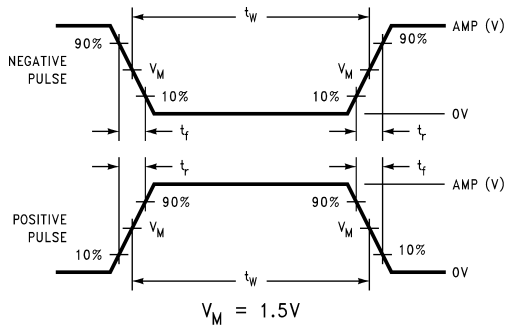


FIGURE 2. Test Input Signal Levels

| 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

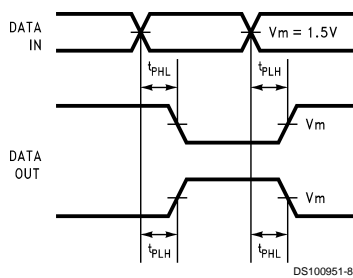


FIGURE 4. Propagation Delay Waveforms for Inverting and Non-Inverting Functions

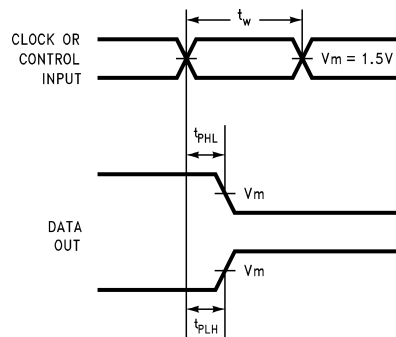


FIGURE 5. Propagation Delay, Pulse Width Waveforms

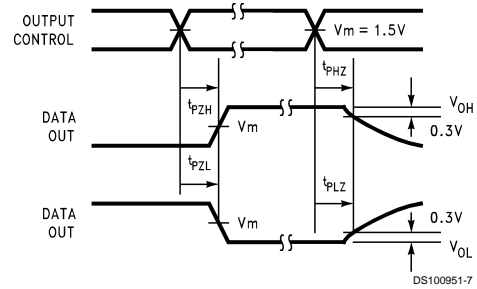


FIGURE 6. TRI-STATE Output HIGH and LOW Enable and Disable Times

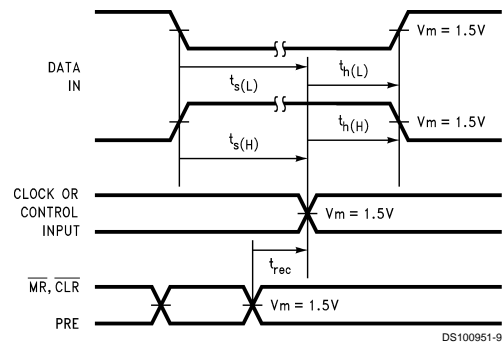
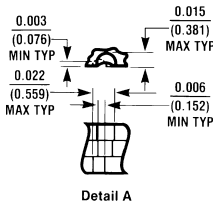
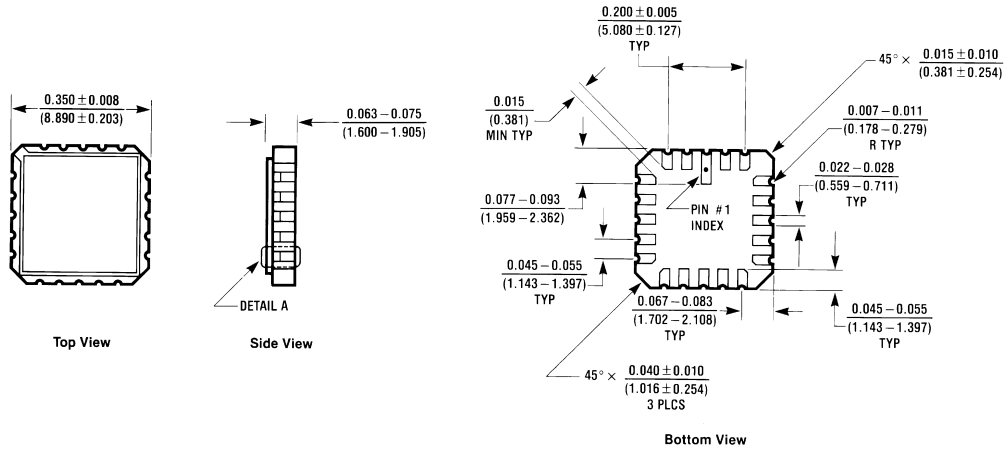


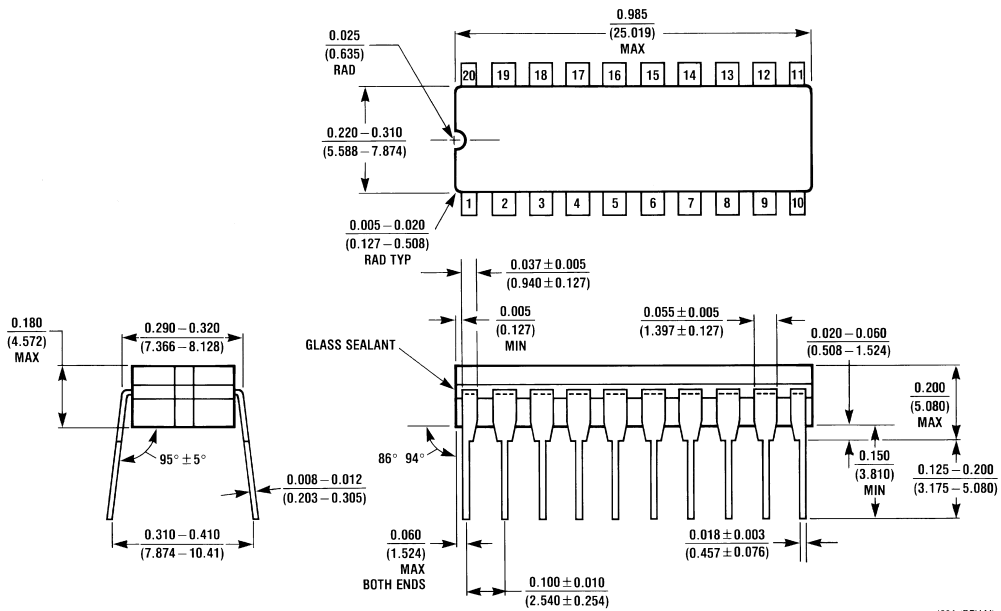
FIGURE 7. Setup Time, Hold Time and Recovery Time Waveforms

Physical Dimensions inches (millimeters) unless otherwise noted



20-Lead Ceramic Leadless Chip Carrier
NS Package Number E20A

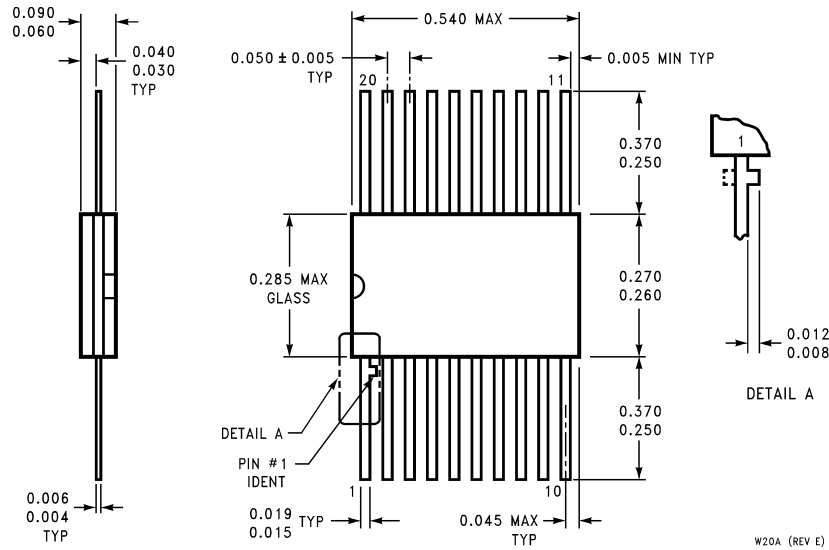
E20A (REV 01)



20-Lead Ceramic Dual-In-Line
NS Package Number J20A

J20A (REV M)

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



**20-Lead Ceramic Flatpack
NS Package Number W20A**

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