- **3-State Buffer-Type Outputs Drive Bus Lines Directly**
- **Bus-Structured Pinout**
- **Package Options Include Plastic Small-Outline (DW) Packages, Ceramic Chip Carriers (FK), and Plastic (NT) and Ceramic (JT) DIPs**
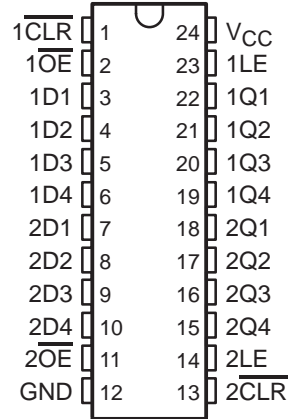
## description

These dual 4-bit D-type latches feature 3-state outputs designed specifically for bus driving. This makes these devices particularly suitable for implementing buffer registers, I/O ports, bidirectional bus drivers, and working registers.
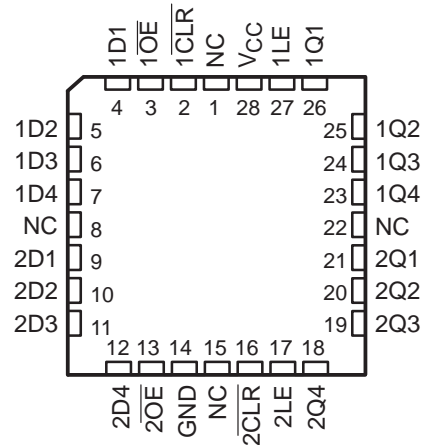
The dual 4-bit latches are transparent D-type latches. While the latch-enable (LE) input is high, the Q outputs follow the data (D) inputs in true form, according to the function table. When LE is low, the outputs are latched. When the clear ($\overline{CLR}$) input goes low, the Q outputs go low independently of LE. The outputs are in a high-impedance state when the output-enable ($\overline{OE}$) input is at a high logic level.

The SN54ALS873B and SN54AS873 are characterized for operation over the full military temperature range of $-55°C$ to $125°C$. The SN74ALS873B and SN74AS873A are characterized for operation from $0°C$ to $70°C$.

**SN54ALS873B, SN54AS873 . . . JT PACKAGE**
**SN74ALS873B, SN74AS873A . . . DW OR NT PACKAGE**
**(TOP VIEW)**

| Pin | Signal | | Pin | Signal |
|---|---|---|---|---|
| 1 | $1\overline{CLR}$ | | 24 | $V_{CC}$ |
| 2 | $1\overline{OE}$ | | 23 | 1LE |
| 3 | 1D1 | | 22 | 1Q1 |
| 4 | 1D2 | | 21 | 1Q2 |
| 5 | 1D3 | | 20 | 1Q3 |
| 6 | 1D4 | | 19 | 1Q4 |
| 7 | 2D1 | | 18 | 2Q1 |
| 8 | 2D2 | | 17 | 2Q2 |
| 9 | 2D3 | | 16 | 2Q3 |
| 10 | 2D4 | | 15 | 2Q4 |
| 11 | $2\overline{OE}$ | | 14 | 2LE |
| 12 | GND | | 13 | $2\overline{CLR}$ |

**SN54ALS873B, SN54AS873 . . . FK PACKAGE**
**(TOP VIEW)**

Top pins: 1D1, $1\overline{OE}$, $1\overline{CLR}$, NC, $V_{CC}$, 1LE, 1Q1 (pins 4, 3, 2, 1, 28, 27, 26)

| Pin | Signal | | Pin | Signal |
|---|---|---|---|---|
| 5 | 1D2 | | 25 | 1Q2 |
| 6 | 1D3 | | 24 | 1Q3 |
| 7 | 1D4 | | 23 | 1Q4 |
| 8 | NC | | 22 | NC |
| 9 | 2D1 | | 21 | 2Q1 |
| 10 | 2D2 | | 20 | 2Q2 |
| 11 | 2D3 | | 19 | 2Q3 |

Bottom pins: 2D4, $2\overline{OE}$, GND, NC, $2\overline{CLR}$, 2LE, 2Q4 (pins 12, 13, 14, 15, 16, 17, 18)

NC – No internal connection

## FUNCTION TABLE
### (each latch)

| INPUTS | | | | OUTPUT |
|---|---|---|---|---|
| $\overline{OE}$ | $\overline{CLR}$ | LE | D | Q |
| L | L | X | X | L |
| L | H | H | H | H |
| L | H | H | L | L |
| L | H | L | X | $Q_0$ |
| H | X | X | X | Z |

**TEXAS INSTRUMENTS**

POST OFFICE BOX 655303 ● DALLAS, TEXAS 75265

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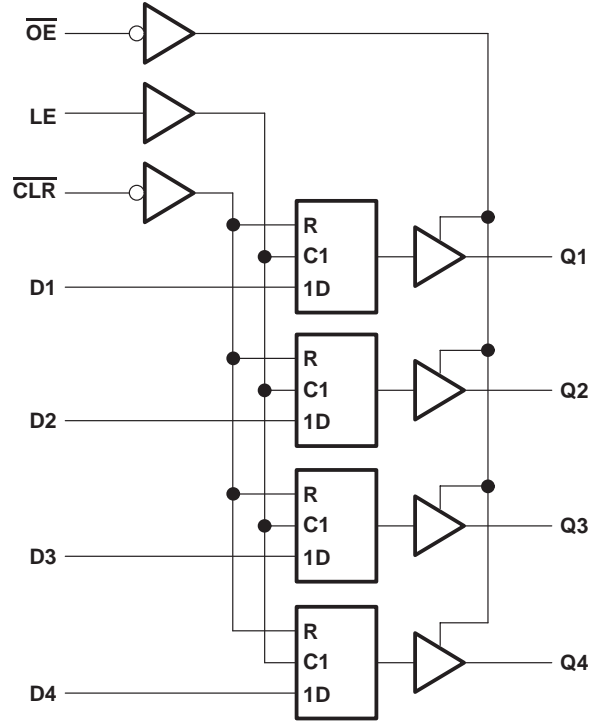# SN54ALS873B, SN54AS873, SN74ALS873B, SN74AS873A
## DUAL 4-BIT D-TYPE LATCHES
## WITH 3-STATE OUTPUTS
SDAS036C – APRIL 1982 – REVISED SEPTEMBER 1994

## logic symbol†
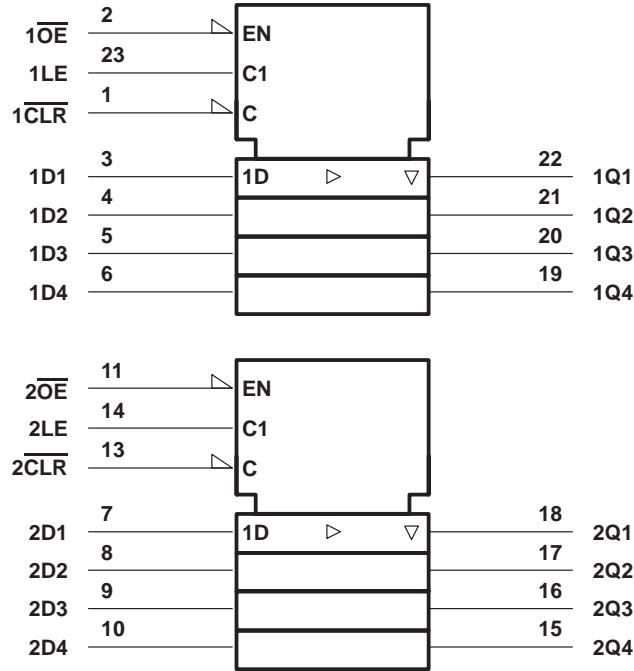


## logic diagram (each quad latch, positive logic)



† This symbol is in accordance with ANSI/IEEE Std 91-1984 and
IEC Publication 617-12.

Pin numbers shown are for the DW, JT, and NT packages.

## absolute maximum ratings over operating free-air temperature range (unless otherwise noted)‡

Supply voltage, $V_{CC}$ ........................................................ 7 V
Input voltage, $V_I$ ........................................................ 7 V
Voltage applied to a disabled 3-state output ........................................ 5.5 V
Operating free-air temperature range, $T_A$: SN54ALS873B ........................ −55°C to 125°C
　　　　　　　　　　　　　　　　　　　　SN74ALS873B ................................ 0°C to 70°C
Storage temperature range ........................................................ −65°C to 150°C

‡ Stresses beyond those listed under "absolute maximum ratings" may cause permanent damage to the device. These are stress ratings only, and
functional operation of the device at these or any other conditions beyond those indicated under "recommended operating conditions" is not
implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

## recommended operating conditions

|  |  | SN54ALS873B | | | SN74ALS873B | | | UNIT |
|---|---|---|---|---|---|---|---|---|
|  |  | MIN | NOM | MAX | MIN | NOM | MAX |  |
| $V_{CC}$ | Supply voltage | 4.5 | 5 | 5.5 | 4.5 | 5 | 5.5 | V |
| $V_{IH}$ | High-level input voltage | 2 |  |  | 2 |  |  | V |
| $V_{IL}$ | Low-level input voltage |  |  | 0.7 |  |  | 0.8 | V |
| $I_{OH}$ | High-level output current |  |  | −1 |  |  | −2.6 | mA |
| $I_{OL}$ | Low-level output current |  |  | 12 |  |  | 24 | mA |
| $T_A$ | Operating free-air temperature | −55 |  | 125 | 0 |  | 70 | °C |

## electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

| PARAMETER | TEST CONDITIONS | | SN54ALS873B | | | SN74ALS873B | | | UNIT |
|---|---|---|---|---|---|---|---|---|---|
| | | | MIN | TYP† | MAX | MIN | TYP† | MAX | |
| $V_{IK}$ | $V_{CC}$ = 4.5 V, | $I_I$ = −18 mA | | | −1.2 | | | −1.2 | V |
| $V_{OH}$ | $V_{CC}$ = 4.5 V to 5.5 V, | $I_{OH}$ = −0.4 mA | $V_{CC}$− 2 | | | $V_{CC}$− 2 | | | V |
| | $V_{CC}$ = 4.5 V | $I_{OH}$ = −1 mA | 2.4 | 3.3 | | | | | |
| | | $I_{OH}$ = −2.6 mA | | | | 2.4 | 3.2 | | |
| $V_{OL}$ | $V_{CC}$ = 4.5 V | $I_{OL}$ = 12 mA | | 0.25 | 0.4 | | 0.25 | 0.4 | V |
| | | $I_{OL}$ = 24 mA | | | | | 0.35 | 0.5 | |
| $I_{OZH}$ | $V_{CC}$ = 5.5 V, | $V_O$ = 2.7 V | | | 20 | | | 20 | µA |
| $I_{OZL}$ | $V_{CC}$ = 5.5 V, | $V_O$ = 0.4 V | | | −20 | | | −20 | µA |
| $I_I$ | $V_{CC}$ = 5.5 V, | $V_I$ = 7 V | | | 0.1 | | | 0.1 | mA |
| $I_{IH}$ | $V_{CC}$ = 5.5 V, | $V_I$ = 2.7 V | | | 20 | | | 20 | µA |
| $I_{IL}$ | $V_{CC}$ = 5.5 V, | $V_I$ = 0.4 V | | | − 0.2 | | | − 0.2 | mA |
| $I_O$‡ | $V_{CC}$ = 5.5 V, | $V_O$ = 2.25 V | −20 | | −112 | −30 | | −112 | mA |
| $I_{CC}$ | $V_{CC}$ = 5.5 V | Outputs high | | 11 | 21 | | 11 | 21 | mA |
| | | Outputs low | | 16 | 29 | | 16 | 29 | |
| | | Outputs disabled | | 20 | 31 | | 20 | 31 | |

† All typical values are at $V_{CC}$ = 5 V, $T_A$ = 25°C.
‡ The output conditions have been chosen to produce a current that closely approximates one half of the true short-circuit output current, $I_{OS}$.

## timing requirements over recommended ranges of supply voltage and operating free-air temperature (unless otherwise noted) (see Figure 1)

| | | | SN54ALS873B | | SN74ALS873B | | UNIT |
|---|---|---|---|---|---|---|---|
| | | | MIN | MAX | MIN | MAX | |
| $t_w$ | Pulse duration | $\overline{CLR}$ low | 15 | | 15 | | ns |
| | | LE high | 10 | | 10 | | |
| $t_{su}$ | Setup time, data before LE↓ | | 10 | | 10 | | ns |
| $t_h$ | Hold time, data after LE↓ | | 7 | | 7 | | ns |

**TEXAS INSTRUMENTS**

## switching characteristics (see Figure 1)

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | $V_{CC}$ = 4.5 V to 5.5 V, $C_L$ = 50 pF, R1 = 500 $\Omega$, R2 = 500 $\Omega$, $T_A$ = MIN to MAX† | | | | UNIT |
|---|---|---|---|---|---|---|---|
| | | | SN54ALS873B | | SN74ALS873B | | |
| | | | MIN | MAX | MIN | MAX | |
| $t_{PLH}$ | D | Q | 2 | 23 | 2 | 14 | ns |
| $t_{PHL}$ | | | 2 | 17 | 2 | 14 | |
| $t_{PLH}$ | LE | Q | 8 | 31 | 8 | 22 | ns |
| $t_{PHL}$ | | | 8 | 26 | 8 | 21 | |
| $t_{PHL}$ | $\overline{CLR}$ | Q | 6 | 27 | 6 | 20 | ns |
| $t_{PZH}$ | $\overline{OE}$ | Q | 4 | 24 | 4 | 18 | ns |
| $t_{PZL}$ | | | 4 | 23 | 4 | 18 | |
| $t_{PHZ}$ | $\overline{OE}$ | Q | 2 | 12 | 2 | 10 | ns |
| $t_{PLZ}$ | | | 2 | 30 | 2 | 15 | |

† For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.

## absolute maximum ratings over operating free-air temperature range (unless otherwise noted)‡

Supply voltage, $V_{CC}$ . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 7 V
Input voltage, $V_I$ . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 7 V
Voltage applied to a disabled 3-state output . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 5.5 V
Operating free-air temperature range, $T_A$: SN54AS873 . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . −55°C to 125°C
SN74AS873A . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 0°C to 70°C
Storage temperature range . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . −65°C to 150°C

‡ Stresses beyond those listed under "absolute maximum ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under "recommended operating conditions" is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

## recommended operating conditions

| | | SN54AS873 | | | SN74AS873A | | | UNIT |
|---|---|---|---|---|---|---|---|---|
| | | MIN | NOM | MAX | MIN | NOM | MAX | |
| $V_{CC}$ | Supply voltage | 4.5 | 5 | 5.5 | 4.5 | 5 | 5.5 | V |
| $V_{IH}$ | High-level input voltage | 2 | | | 2 | | | V |
| $V_{IL}$ | Low-level input voltage | | | 0.8 | | | 0.8 | V |
| $I_{OH}$ | High-level output current | | | −12 | | | −15 | mA |
| $I_{OL}$ | Low-level output current | | | 32 | | | 48 | mA |
| $T_A$ | Operating free-air temperature | −55 | | 125 | 0 | | 70 | °C |

**TEXAS INSTRUMENTS**

POST OFFICE BOX 655303 ● DALLAS, TEXAS 75265

## electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

| PARAMETER | TEST CONDITIONS | | SN54AS873 MIN | TYP† | MAX | SN74AS873A MIN | TYP† | MAX | UNIT |
|---|---|---|---|---|---|---|---|---|---|
| $V_{IK}$ | $V_{CC}$ = 4.5 V, | $I_I$ = −18 mA | | | −1.2 | | | −1.2 | V |
| $V_{OH}$ | $V_{CC}$ = 4.5 V to 5.5 V, | $I_{OH}$ = −2 mA | $V_{CC}-2$ | | | $V_{CC}-2$ | | | V |
| | $V_{CC}$ = 4.5 V | $I_{OH}$ = −12 mA | 2.4 | 3.2 | | | | | |
| | | $I_{OH}$ = −15 mA | | | | 2.4 | 3.3 | | |
| $V_{OL}$ | $V_{CC}$ = 4.5 V | $I_{OL}$ = 32 mA | | 0.25 | 0.5 | | | | V |
| | | $I_{OL}$ = 48 mA | | | | | 0.35 | 0.5 | |
| $I_{OZH}$ | $V_{CC}$ = 5.5 V, | $V_O$ = 2.7 V | | | 50 | | | 50 | µA |
| $I_{OZL}$ | $V_{CC}$ = 5.5 V, | $V_O$ = 0.4 V | | | −50 | | | −50 | µA |
| $I_I$ | $V_{CC}$ = 5.5 V, | $V_I$ = 7 V | | | 0.1 | | | 0.1 | mA |
| $I_{IH}$ | $V_{CC}$ = 5.5 V, | $V_I$ = 2.7 V | | | 20 | | | 20 | µA |
| $I_{IL}$ | $V_{CC}$ = 5.5 V, | $V_I$ = 0.4 V | | | − 0.5 | | | − 0.5 | mA |
| $I_O$‡ | $V_{CC}$ = 5.5 V, | $V_O$ = 2.25 V | −30 | | −112 | −30 | | −112 | mA |
| $I_{CC}$ | $V_{CC}$ = 5.5 V | Outputs high | | 68 | 110 | | 68 | 110 | mA |
| | | Outputs low | | 67 | 109 | | 67 | 109 | |
| | | Outputs disabled | | 80 | 129 | | 80 | 129 | |

† All typical values are at $V_{CC}$ = 5 V, $T_A$ = 25°C.
‡ The output conditions have been chosen to produce a current that closely approximates one half of the true short-circuit output current, $I_{OS}$.

## timing requirements over recommended ranges of supply voltage and operating free-air temperature (unless otherwise noted) (see Figure 1)

| | | | SN54AS873 MIN | MAX | SN74AS873A MIN | MAX | UNIT |
|---|---|---|---|---|---|---|---|
| $t_w$* | Pulse duration | $\overline{CLR}$ low | 5 | | 5 | | ns |
| | | LE high | 6 | | 5 | | |
| $t_{su}$* | Setup time, data before LE↓ | | 2 | | 2 | | ns |
| $t_h$* | Hold time, data after LE↓ | | 4.5 | | 4.5 | | ns |

* On products compliant to MIL-STD-883, Class B, these parameters are based on characterization data but are not production tested.

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## switching characteristics (see Figure 1)

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | $V_{CC}$ = 4.5 V to 5.5 V, $C_L$ = 50 pF, R1 = 500 Ω, R2 = 500 Ω, $T_A$ = MIN to MAX† | | | | UNIT |
|---|---|---|---|---|---|---|---|
| | | | SN54AS873 | | SN74AS873A | | |
| | | | MIN | MAX | MIN | MAX | |
| $t_{PLH}$ | D | Q | 3 | 9 | 3 | 9.5 | ns |
| $t_{PHL}$ | | | 3 | 7 | 3 | 7.5 | |
| $t_{PLH}$ | LE | Q | 6 | 14 | 6 | 13 | ns |
| $t_{PHL}$ | | | 4 | 9 | 4 | 7.5 | |
| $t_{PHL}$ | $\overline{CLR}$ | Q | 3 | 10 | 3 | 9 | ns |
| $t_{PZH}$ | $\overline{OE}$ | Q | 2 | 8 | 2 | 6.5 | ns |
| $t_{PZL}$ | | | 4 | 11 | 4 | 10.5 | |
| $t_{PHZ}$ | $\overline{OE}$ | Q | 2 | 8 | 2 | 7.5 | ns |
| $t_{PLZ}$ | | | 2 | 8.5 | 2 | 7.5 | |

† For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.

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## PARAMETER MEASUREMENT INFORMATION

**7 V**

**LOAD CIRCUIT FOR 3-STATE OUTPUTS**

**SWITCH POSITION TABLE**

| TEST | S1 |
|------|-----|
| $t_{PLH}$ | Open |
| $t_{PHL}$ | Open |
| $t_{PZH}$ | Open |
| $t_{PZL}$ | Closed |
| $t_{PHZ}$ | Open |
| $t_{PLZ}$ | Closed |
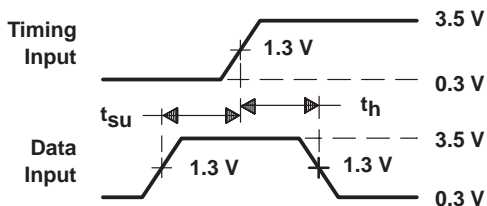
**VOLTAGE WAVEFORMS
SETUP AND HOLD TIMES**

**VOLTAGE WAVEFORMS
PULSE DURATION**
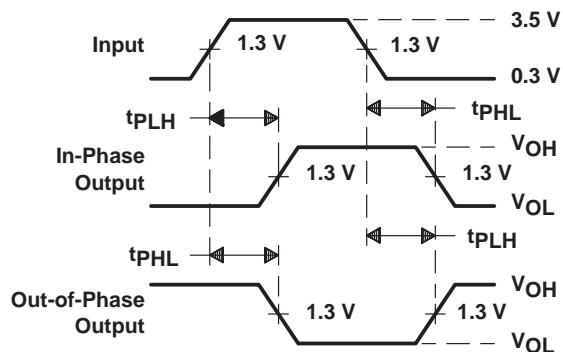
**VOLTAGE WAVEFORMS
PROPAGATION DELAY TIMES**
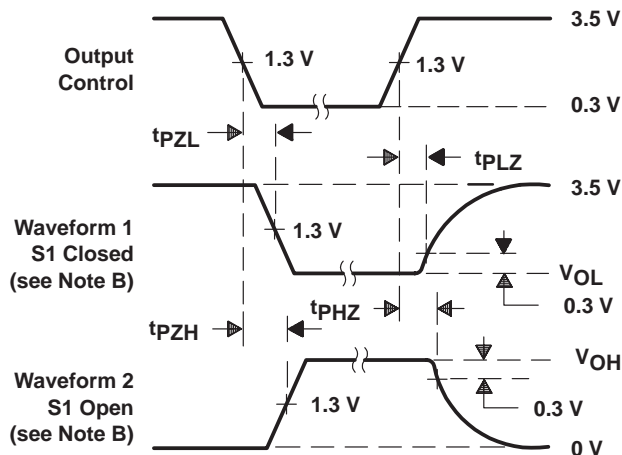
**VOLTAGE WAVEFORMS
ENABLE AND DISABLE TIMES, 3-STATE OUTPUTS**

NOTES: A. $C_L$ includes probe and jig capacitance.
B. Waveform 1 is for an output with internal conditions such that the output is low except when disabled by the output control.
Waveform 2 is for an output with internal conditions such that the output is high except when disabled by the output control.
C. All input pulses are supplied by generators having the following characteristics: PRR ≤ 1 MHz, $Z_O$ = 50 Ω, $t_r$ ≤ 2 ns, $t_f$ ≤ 2 ns.
D. The outputs are measured one at a time with one transition per measurement.

**Figure 1. Load Circuit and Voltage Waveforms**

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